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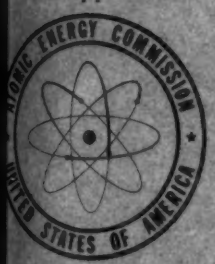

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NUCLEAR SCIENCE ABSTRACTS

Volume 10 September 30, 1956 No. 18A

GENERAL

ATOMIC POWER

7376 AERE-Inf/Bib-97
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
THE UNITED KINGDOM ATOMIC ENERGY POWER PROGRAMME: A SELECTED READING LIST. Mar. 1956. 4p.

7377 IGRL-IB/R-6
United Kingdom Atomic Energy Authority. Industrial Group H. Q., Risley, Lancs, England.
NUCLEAR POWER ENGINEERING. A SELECTED AND ANNOTATED BIBLIOGRAPHY. J. C. Hartas, comp. Apr. 1956. 10p.

A selected and annotated bibliography was prepared for distribution to those about to enter the nuclear engineering field. No mention is made of report literature issued from atomic energy establishments. (F.S.)

7378
A BIBLIOGRAPHY OF CURRENT MATERIALS DEALING WITH ATOMIC POWER AND RELATED ATOMIC ENERGY SUBJECTS FOR NON-SPECIALIST AND LAY PERSONS, JUNE 1955. Jane E. Boswell, comp. Detroit, Fund for Peaceful Atomic Development, 1955. 233p. $1.25.

RESEARCH PROGRAMS

7379
NUCLEAR SCIENCE AND ENGINEERING TRAINING IN THE UNITED STATES. Detroit, Fund for Peaceful Atomic Development, 1955. 57p.

A summary of nuclear training facilities at colleges, universities, and AEC laboratories in the United States is presented. Areas of research in physics, chemistry, engineering, and associated fields are outlined. Special arrangements for foreign students are described. Cost estimates for room, board, and tuition are included. (C.W.H.)

BIOLOGY AND MEDICINE

7380 AMRL-177
Army Medical Research Lab., Fort Knox, Ky.
SPECTRAL REFLECTANCE OF THE SKIN OF RATS AND RABBITS IN THE REGION 420–1000 mμ. James M. Dimitroff, John A. Jacquez, and Hans F. Kuppenheim. Mar. 2, 1955. 15p.

Spectral reflectance curves for the skin of rats and rabbits are presented for the wavelength 420 to 1000 mμ inclusive. The shapes of the reflectance curves of rat, rabbit, and white human skin are similar. All show the prominent absorption bands of hemoglobin and water. (auth)

7381 UCLA-372
California. Univ., Los Angeles. Atomic Energy Project.
PHARMACOLOGICAL EFFECTS PRODUCED BY INTRACEREBRAL INJECTION OF DRUGS IN THE CONSCIOUS MOUSE. Thomas J. Haley and W. G. McCormick. June 30, 1956. 25p. Contract AT-04-1-GEN-12. $4.80(ph OTS); $2.70(mf OTS).

7382 UCLA-373
California. Univ., Los Angeles. Atomic Energy Project.
STUDIES OF THE NEW HAMPSHIRE CHICKEN EMBRYO. VII. ULTRACENTRIFUGE PATTERNS OF PLASMA LIPOPROTEINS. Ole Arne Schjeide. July 11, 1956. 29p. Contract AT-04-1-GEN-12. $4.80(ph OTS); $2.70(mf OTS).

7383 AEC-tr-2529
HISTOCHEMICAL BASES FOR STAINING MUCO-POLYSACCHARIDES IN TISSUES WITH BLUE ALCIAN 8 G.N. C. Rizzoli. Translated from Boll. soc. ital. biol. sper. 31, 422-5(1955). 8p.

7384 AERE-Lib/Trans-737
THE EFFECT OF INTERCELLULAR CEMENTING SUBSTANCES ON THE STAINING OF COLLAGENIC AND ELASTIC TISSUE. G. F. Bahr and K. H. Huhn. Translated by F. Hudswell from Arch. Dermatol. u. Syphil is 194, 400-4(1952). 6p.

7385 AERE-Lib/Trans-748
OBSERVATIONS ON THE ELASTIC FIBRES WITH THE ELECTRON MICROSCOPE. L. Gotte and P. F. Munari. Translated by S. Pease from Boll. soc. ital. biol. sper. 30, 814-16(1954). 6p.

7386 TT-585
ON THE CLEAR AND OPAQUE MUSCLE FIBRES OF VERTEBRATES AND HUMANS. (Über helle und trübe Muskelfasern bei Wirbeltieren und beim Menschen). Walther Ewald. Translated by D. A. Sinclair from Abhandl. senckenberg. Naturforsch. Ges., No. 31(2), 109-50(1912). 86p.

RADIATION EFFECTS

7387 AF-SAM-55-65
School of Aviation Medicine, Randolph AFB, Tex.
SERUM PROTHROMBIN TIME PROLONGATION FOLLOWING TOTAL-BODY X-IRRADIATION IN MAN. Niel Wald. Dec. 1955. 5p.

Hematological studies were carried out on 41 patients with disseminated neoplastic disease, receiving therapeutic whole-body x irradiation. An increase in the average serum prothrombin time and in the incidence of prolonged serum prothrombin times was found after irradiation. Greater sensitivity resulted when pure fibrinogen was used in place of prothrombin-free plasma in the one-stage serum prothrombin test. (auth)

7388 AF-SAM-55-114
School of Aviation Medicine, Randolph AFB, Texas. and Chicago. Univ. Air Force Radiation Lab.
INFLUENCE OF X-RAY ON OXYGEN CONSUMPTION BY HEMATOPOIETIC TISSUES OF RATS. Maurice F. Sullivan and Kenneth P. DuBois. Feb. 1956. 9p.

A study was made of the effects of whole-body x irradiation on the oxygen consumption by hematopoietic tissues of irradiated animals. For these measurements animals were sacrificed at various intervals after 400 r of x ray and manometric estimation of the oxygen consumption by slices of spleen and thymus glands were made. The endogenous respiration of these tissues decreased to approximately

50% of the normal value in 48 hr after 400 r of x ray after which time gradual reversal of the inhibition occurred. With prolonged incubation periods of 3 hr the decline in the rate of endogenous respiration was much faster in the tissues from irradiated animals than in the case of unirradiated animals. The addition of various intermediates of the tricarboxylic acid cycle failed to alleviate the radiation-induced depression of oxygen consumption. Administration of cysteine or p-aminopropiophenone prior to x-ray reduced the amount of inhibition of endogenous respiration produced by 400 r of x ray. (auth)

7389 AF-SAM-55-139
School of Aviation Medicine, Randolph AFB, Tex.
TIME TREND OF HYPERLIPOPROTEINEMIA AFTER RADIATION INJURY. Norman Weiner, Harry G. Albaum, and Lawrence J. Milch. Dec. 1955. 8p.

Rabbits subjected to local radiation injury were found to develop, during the first week post-exposure, elevated plasma lipid levels which persisted for several weeks thereafter. The time curves of individual lipid and lipoprotein components are presented and the results discussed. Muscle histology and ATP levels are also presented to show the progression of local tissue changes after radiation. (auth)

7390 NP-5907
Naval Medical Research Inst., Bethesda, Md. and Armed Forces Inst. of Pathology, Washington, D. C.
BETA RADIATION LESION OF THE SKIN. Memorandum Report 56-1. Robert A. Conard and Carl F. Tessmer. Dec. 9, 1955. 7p.

A case history of a lesion on the forehead and right eyebrow region presumably due to irradiation from contamination with fission product material, is presented. The erythema, dry desquamation, depigmentation, symptoms of burning and itching, increased sensitivity to sunlight hyperesthesia, epilation of the eyebrows (with regrowth of hair) and minimal histological changes (17 months later) particularly in the elastic tissue were considered consistent with radiation damage to the skin. The most unusual feature of the lesion was the regrowth of white hair in the affected region of the right eyebrow which was formerly black in color. (auth)

7391 NP-6017
National Academy of Sciences.
THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 123p.

Separate abstracts have been prepared on six sections of this report. (See also NP-6016.) (C.H.)

7392 NP-6017(p.1-31)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON GENETIC EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 31p.

Preliminary findings are presented from a review of data on the genetic effects of atomic radiations. It was concluded that radiations produce mutations and that mutations are in general harmful. It is difficult, at the present state of knowledge of genetics, to estimate just how much or what kind of harm will appear in each future generation after mutant genes are induced by radiations. Different geneticists prefer differing ways of describing this situation, but all agree the potential danger is great. A dose of not more than 10 r of man-made radiation to the reproductive cells is suggested as a maximum safe lifetime dose. The average person now receives some 3 or 4 r from medical x rays. This is roughly the same as the unavoidable dose received from background radiation. The fall-out from nuclear weapons testing has, so far, led to considerably less irradiation of the population than have the medical uses, and has therefore been less detrimental. (C.H.)

7393 NP-6017(p.32-44)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON PATHOLOGIC EFFECTS OF ATOMIC RADIATION. p.32-44 of THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 14p.

A review was made of results from voluminous experimental work on the effects of radiation on animals and such data on human beings as are available. Both acute and chronic effects of radiation were considered. It was concluded that the sequence of pathological changes is quite similar in man and in animals, although man has certain definable peculiarities of response. The human data are summarized. Some success has been achieved in the therapy of radiation injuries using antibiotics and properly timed blood transfusions. Shielding of a portion of the body seems to give a degree of protection disproportionately large for the mass shielded. (C.H.)

7394 NP-6017(p.85-98)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION ON AGRICULTURE AND FOOD SUPPLIES. p.85-98 of THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 14p.

A survey of the effects of nuclear radiation on agriculture led to the conclusion that no drastic changes in agricultural production are imminent as a result of applications of radiation. However, radiation techniques and radioisotopes provide new tools for research. Few varieties of economic plants have been developed from radiation-induced mutants, but the potentialities of this procedure are recognized. Other fields of interest to agriculture include the plant uptake and fixation of fission products; the use of domestic animals in studies of radiation effects; the use of radioisotopes as tracers in studies of insecticides; the control of insects by irradiation; and applications of radiation to the preservation of foodstuffs and the lengthening of shelf life of either refrigerated or unrefrigerated foodstuffs. (C.H.)

7395 NP-6038
Naval Medical Research Inst., Bethesda, Md.
SOME EFFECTS OF IONIZING RADIATION ON THE PHYSIOLOGY OF THE GASTROINTESTINAL TRACT. A REVIEW. Lecture and Review Series No. 56-2. Robert A. Conard. Mar. 29, 1956. 19p.

7396 ORO-152
Texas Agricultural Experiment Station, College Station, Tex.
FINAL REPORT ON AEC PROJECT 815. July 2, 1956. 11p. Contract AT(40-1)-1307—Modification No. 2. $3.30 (ph OTS); $2.40(mf OTS).

Data are presented from a study of the effects of doses of whole-body x radiation ranging from 50 to 500 r administered at various ages on the pituitary gland, thyroid gland, pancreas, and spleen of cockerels, egg production of the progeny of irradiated male chickens; the reproductive performance of progeny of irradiated males; and the sex ratio of chicks dying during the third week of incubation as related to irradiation dosage of the sire of both parents of these chicks. (C.H.)

7397 ORO-153
Florida. Univ., Gainesville.
SOME EFFECTS OF RADIATION INJURY ON PLANTS AND ANIMALS. Final Report. Work Period from August 19, 1949 to December 31, 1952. 162p. Contract AT(40-1)-267. $25.80(ph OTS); $7.80(mf OTS).

Data are presented from a study on the bioelectric

potentials of plants and animals as a function of radiation injury. Possible applications in the diagnosis of radiation injury are discussed. (C.H.)

7398 UR-449

Rochester, N. Y. Univ. Atomic Energy Project.
HISTOLOGICAL TECHNIQUES FOR THE DIFFERENTIAL STAINING OF BURNED AND NORMAL TISSUES. J. R. Hinshaw and H. E. Pearse. May 9, 1956. 18p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

Much burn research is handicapped by the lack of a method for determining accurately the depth of injury. Histological techniques used for this in the past have been difficult to interpret, particularly for an investigator inexperienced in micropathology. A search was made for staining methods which would provide a striking color contrast between the normal and the burned tissues of the skin. Such techniques have been found and are described. Their usefulness in various research problems is discussed. (auth)

7399 USNRDL-TR-76

Naval Radiological Defense Lab., San Francisco.
SOME RADIATION RESPONSES OF TWO SPECIES OF BATS EXPOSED TO WARM AND COLD TEMPERATURES. G. K. Osborn and D. J. Kimeldorf. Feb. 9, 1956. 14p. Project NM 006 015.04.

Bats which were kept at warm temperatures and trained to eat an artificial diet, died after doses of total-body x irradiation that fall within the lethal range for other mammals. A remarkably long survival time after supralethal doses was observed. Observance of terminal losses in body weight, of anorexia, and of gastrointestinal hemorrhage indicated that processes similar to those occurring in other irradiated mammals take place in bats following their exposure to a lethal dose of ionizing radiation. The influence of a temporary period of cold exposure immediately following irradiation was, in general, to prolong the latent period of various responses without abolishing their ultimate appearance. Thus, while survival time was extended markedly the mortality response remained unaffected. (auth)

7400 USNRDL-TR-89

Naval Radiological Defense Lab., San Francisco.
THE EFFECTS OF COMBINED ADMINISTRATION OF STRONTIUM-90 AND EXTERNAL RADIATION. S. H. Cohn and W. L. Milne. May 21, 1956. 24p. Project NM 006-015.04.

The effects of Sr^{90} and external total-body radiation administered separately and in combination were determined in terms of platelet level, body weight, mortality, bone alkaline phosphatase level, and thymic and spleen weight. Of these biological indicators, platelet level depression was the most sensitive and reproducible index of radiation injury. The effects produced by radiation from internally deposited Sr^{90} plus x irradiation differed from those resulting from total-body external radiation administered alone in that the onset of radiation damage was more rapid and the recovery was more gradual. The depression of platelet level was proportional to the dose of Sr^{90} administered either alone or in combination with x irradiation. The secondary depression of platelet level in animals receiving a sublethal dose of total-body irradiation (625 r) at 30 days following Sr^{90} injection revealed a residual bone marrow damage proportional to the amount of internal emitter. The depression of platelet level produced by the simultaneous administration of a sublethal dose (300 r) of external radiation and Sr^{90} was found to be the sum of the maximum platelet depressions caused by each when administered singly. Acute effect (i.e., those appearing with 30 days) following administration of Sr^{90} were observed only for dose levels of 0.1 μc/g of body weight or higher. These effects were observed only in the platelet level depression. This dose of Sr^{90} also enhanced the effects produced by subsequent doses of sublethal external radiation. Following combined exposure to both external and internal radiation, acute effects attributable to the internal emitter were again observed only above a threshold value of 0.1 μc/g Sr^{90}. (auth)

7401 AEC-tr-2502

X-RAY STIMULATION OF CHROMOSOME MUTATIONS OF DROSOPHILA MELANOGASTER. II. THE FREQUENCY OF THE PRIMARY FRAGMENTATION OCCURRENCES ACCORDING TO INVESTIGATIONS WITH RING-X-CHROMOSOMES. Hans Bauer. Translated from Chromosoma 2, 407-56(1942). 82p.

7402

SPONTANEOUS AND RADIATION-INDUCED IRIS ATROPHY IN MICE. W. H. Benedict, K. W. Christenberry, and A. C. Upton (Oak Ridge National Lab., Tenn.). Am. J. Ophthalmol. 40, No. 5, Part II, 163-9(1955) Nov.

7403

COMPARISON OF X-RAY-INDUCED MUTATION RATES IN DROSOPHILA AND MICE. W. L. Russell (Oak Ridge National Lab., Tenn.). Am. Naturalist 90, 69-80(1955) Jan.-Feb.

7404

VERTEBRATE RADIOBIOLOGY: PHYSIOLOGY. Abraham Edelmann (Brookhaven National Lab., Upton, N. Y.) Ann. Rev. Nuclear Sci. 5, 413-24(1955.

Recent advances in radiation protection and radiation effects in animals are reviewed. 104 references. (C.W.H.)

7405

THE ESTIMATION OF THE RADIATION-SENSITIVE VOLUME OF ACTH BY DEUTERON BOMBARDMENT. Ralph G. Child, Arden W. Moyer, Ernest Pollard, and Herald R. Cox (American Cyanamid Company, Pearl River, New York). Arch. Biochem. Biophys. 61, 291-8(1956) April.

ACTH has been bombarded in the dry state by fast deuterons, and the inactivation of hormonal function has been studied. It is inactivated according to the relation $\ln(N/N_0) = -SD$, and calculations indicate that the sensitive volume to one primary ionization corresponds to an inactivation weight of 2400 ± 800. (auth)

7406

EFFECTS OF X-IRRADIATION, NITROGEN MUSTARD, FASTING, CORTISONE AND ADRENALECTOMY ON TRANSAMINASE ACTIVITY IN THE RAT. Myron Brin and Ralph W. McKee (Boston City Hospital, Boston, Massachusetts and California Medical School, Los Angeles, California). Arch. Biochem. Bisphys. 61, 384-9(1956) April.

The enhanced transaminase activities in rat liver resulting from x irradiation, nitrogen mustard, and starvation, and in intestine resulting from starvation are probably secondary to the influence of hormonal outflow of the adrenal cortex. Cortisone resulted in increased, and adrenalectomy in decreased activities of these enzymes. The depressed transaminase activity in intestine following x irradiation and nitrogen mustard was correlated with the concomitant destruction of the mucosal cells. The glutamic-alanine enzyme was far more sensitive to stress than the glutamic-aspartic enzyme. The relation between irradiation and adrenal stimulation was stressed. (auth)

7407

EFFECTS OF X-IRRADIATION OF GLYCOGENOLYSIS, GLYCOGENESIS AND GLUCONEOGENESIS IN THE RAT. Ralph W. McKee and Myron Brin (University of California School of Medicine, Los Angeles, California and Boston City Hospital, Boston, Massachusetts). Arch. Biochem. Biophys. 61, 390-6(1956) April.

In the x-irradiated and fasted rat, the liver undergoes, during the first 8 to 10 hr postirradiation, a fall in glycogen similar to that seen in the nonirradiated, fasted rat. This is followed in the irradiated animal by a striking increase in the liver glycogen which reaches a maximum in about 50 hr. There follows a precipitous fall with the glycogen values reaching abnormally low values in 75 to 80 hr. A similar rapid rise and fall in the liver glycogen was seen when fasting preceded the irradiation. A comparable increase, but progressively smaller influence, is seen when the total-body x irradiation is decreased to 250 r. Blood-sugar values increased to high normal nonfasting levels during the period of fasting and simultaneous with excessive glycogen synthesis. The blood-sugar levels began falling as the liver glycogen values fell. Excess glucose is handled normally as indicated by tolerance tests. Adrenalectomy and hypophysectomy prevented these changes in the x irradiated rats indicating a strong gluconeogenic influence. X irradiation of one of a pair of parabiot rats produced this same glycogenic effect in the irradiated animal with a reflection of the effect in the nonirradiated animal of the pair. (auth)

7408

A SIGN OF SEVERE RADIATION INJURY OBSERVED IN THE ERYTHROCYTE SEDIMENTATION OF DOGS. George A. Sacher (Argonne National Lab., Lemont, Ill.). Blood 11, 174-83(1956) Feb.

The erythrocyte sedimentation curves obtained from dogs exposed to x radiation or injected with radiostrontium or Pu were found to differ following exposure to lethal and sublethal dosages. (C.H.)

7409

EFFECTS OF PAIRED DOSES OF WHOLE BODY IRRADIATION IN THE RHESUS MONKEY. Edith Patterson, C. W. Gilbert, and Mary V. Haigh (The Christie Hospital and Holt Radium Institute, Manchester, England). Brit. J. Radiol. 29, 218-26(1956) April.

Experiments were designed to study the effect of paired doses separated by seven or 20 days on the LD_{50} in rhesus monkeys irradiated with x rays. The rate of recovery from an initial dose of 260 r was studied and a time to half recovery of 4.8 days was found; this was contrasted with similar studies in other animals. The effects on the symptoms and on the haemopoietic system of paired doses were compared with those of single session radiation, for although the doses compared were biologically equivalent in the three groups as far as survival was concerned, the actual amount of radiation given to the paired groups was greater. A 7-day gap between the doses showed effects on the peripheral blood counts which resembled in their pattern those obtained with a single exposure; a 20-day gap resulted in a greater delay in recovery of the cells and in a loss of those violent fluctuations which characterised the recovery phase of certain of the blood cells after a single or 7-day paired irradiation. The interval of 20 days would seem to be the important modifying factor, not the dose as such. The relative importance of certain of the symptoms as indicators of prognosis is discussed and it is concluded that the behavior of the reticulocytes is the best indication of the probable fate of the individual. (auth)

7410

ON THE RATE OF TRACER INCORPORATION INTO THE PROTEINS OF IRRADIATED ANIMAL ORGANS. RATE OF TRACER INCORPORATION INTO THE PROTEIN IN THE CASE OF HEAD IRRADIATION WITH A DOSE OF 4500 r. S. N. Aleksandrov. Doklady Akad. Nauk S.S.S.R. 106, 569-72(1956) Jan. 21. (In Russian)

Analytic studies are made of the causes producing the changes in the rate of tracer incorporation into the protein of a series of organs in mice exposed to total x-ray radiation in doses inducing acute and sub-acute forms of radiation sickness. Also, the tracer incorporation rate into the protein during irradiation sickness in cases where only heads of animals were exposed was investigated. A dose of 4500 r and radioactive sulfur S^{35} as a tracer were used. (R.V.J.)

7411

MUTANTS RECOVERED AFTER EXPOSURE OF STREPTOMYCES VENEZUELAE TO X-RAYS. Ralph B. Gwatkin and David Gottlieb (University of Illinois, Urbana, Illinois). J. Bacteriol. 71, 328-32(1956) March.

7412

PROTEIN SYNTHESIS AND RIBONUCLEIC ACID METABOLISM IN MOUSE PANCREAS IN VITRO AFTER WHOLE BODY IRRADIATION WITH X-RAYS. Mabel R. Hokin and Lowell E. Hokin (Montreal General Hospital, Canada). J. Biol. Chem. 219, 85-94(1956) Mar.

7413

BONE METABOLISM. II. TOXICITY AND METABOLISM OF RADIOACTIVE STRONTIUM (Sr^{90}) IN RATS. Robert D. Ray, Duncan M. Thomson, Norvelle K. Wolff, and Duane LaViolette (Univ. of Washington School of Medicine, Seattle). J. Bone and Joint Surg. 38A, 160-74(1956) Jan.

7414

RETICULUM-CELL SARCOMA OF RATS. APPARENT INHIBITION BY X IRRADIATION. David V. Brown and Theodore A. Thorson (University of Washington, Seattle, Wash.). J. Nat. Cancer Inst. 16, 1197-205(1956) April.

Having determined that the prolonged subcutaneous injection of dilute solutions of trypan blue produced reticulum-cell sarcomas in rats, we decided to investigate the effect of whole-body preirradiation on the development of these dye-induced tumors. In view of previous experimental work on the carcinogenic effects of irradiation, we felt that it might enhance the development of these neoplasms. A group of young Wistar rats were given 400 r of total-body irradiation and then treated with trypan-blue injections for periods up to 547 days. A second group received only the trypan blue. Although the dye-stained controls showed reticulum-cell sarcomas in the numbers expected from earlier work, none of the irradiated animals developed these tumors. Work of others indicating that the more primitive reticuloendothelial elements are relatively resistant to the destructive effects of irradiation, although they may also be stimulated to proliferation, is reviewed. It is concluded that the x-ray treatment may have modified the reticulum cells in some way so that they did not respond to trypan blue in the established fashion. An unexpectedly high number of carcinomas of the breast were found in the irradiated and dye-stained animals. The significance of this observation is unknown. (auth)

7415

MULTIPLICATION OF ST. LOUIS ENCEPHALITIS VIRUS IN MICE EXPOSED TO ROENTGEN RADIATION. F. S. Cheever and Lee W. Smith (Univ. of Pittsburgh Graduate School of Public Health). Lab. Invest. 5, 44-52(1956) Jan.-Feb.

7416

EFFECTS OF SINGLE AND FRACTIONATED DOSES OF X-RAYS ON MOUSE EMBRYOS. Robert Auerbach (Oak Ridge National Lab., Tenn.). Nature 177, 574(1956) Mar. 24.

The results of studies on the effects of single and fractionated doses of x radiation on developing mouse embryos in vivo indicate that while the incidence of malformation is not affected by fractionation, the severity of embryonic defects is far greater in response to a fractionated dose than in response to a single dose. (C.H.)

7417
DOMINANT LETHALITY INDUCED BY X-RAYS IN HAPLOID AND DIPLOID SACCHAROMYCES CEREVISIAE. M. E. Owen and R. K. Mortimer (Univ. of California, Berkeley). Nature 177, 625-6(1956) Mar. 31.

7418
MITOSIS ACTIVITY AND PHASE FREQUENCY AFTER RADIATION OF VICIA FABA WITH 31 MEV AND 180 KEV X RADIATION. Hedi Fritz-Niggle. Naturwissenschaften 43, 112-13(1956) Mar. (In German)

7419
A NEW APPROACH TO THE MATHEMATICAL THEORY OF THE ACTION OF HIGH-ENERGY RADIATION ON SINGLE CELLS. I. FORMULATION OF THE THEORY. Robert A. Wijsman (National Institutes of Health, Public Health Service). Radiation Research 4, 257-69(1956) April.

7420
A NEW APPROACH TO THE MATHEMATICAL THEORY OF THE ACTION OF HIGH-ENERGY RADIATION ON SINGLE CELLS. II. CONSEQUENCES OF THE THEORY. Robert A. Wijsman (National Institutes of Health, Public Health Service). Radiation Research 4, 270-7(1956) April.

7421
THE NATURE OF INTESTINAL RADIATION DEATH. Henry Quastler (University of Illinois and the Carle Foundation, Urbana, Illinois). Radiation Research 4, 303-20(1956) April.

7422
PLASMA LIPOPROTEINS AND MUSCLE ADENOSINETRIPHOSPHATE IN RABBITS AFTER LOCAL IRRADIATION. Lawrence J. Milch, James V. Stinson, and Harry G. Albaum (USAF, Randolph Field, Texas, and Brooklyn College, Brooklyn, New York). Radiation Research 4, 321-5(1956) April.

Rabbits were subjected to local irradiation of the hind limb with three dose levels of x irradiation and with 30,000 r of γ irradiation at varying dose rates up to 3800 r/min. The x-irradiated animals were sacrificed at 24 hr after exposure; separate groups of γ-irradiated rabbits were sacrificed at 24 and 96 hr postexposure. Analyses revealed that plasma lipid and lipoprotein concentrations were significantly increased in all irradiated rabbits and that the lipoprotein change was independent of dose, radiation type, and, in the instance of γ-radiation, dose rate and time after exposure up to 4 days. The ATP concentrations of the irradiated muscles, on the other hand, were consistently unaltered by 30,000 r of γ-rays and by all dosages of x rays except 25,000 r. (auth)

7423
THE RELATIVE BIOLOGICAL EFFECTIVENESS OF 180-Kevp AND 22.5-Mevp X-RAYS DETERMINED FROM THE DOSE-SURVIVAL CURVE OF SACCHAROMYCES CEREVISIAE. Shirley E. Gunter, Henry I. Kohn, Ella B. Tyree, John S. Laughlin, Jacques Ovadia, Gerald Shapiro, and Patricia Thompson. Radiation Research 4, 326-38(1956) April.

7424
SCIENTIFIC AND TECHNOLOGICAL PROBLEMS INVOLVED IN USING IONIZING RADIATIONS FOR THE PRESERVATION OF FOOD. DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH FOOD INVESTIGATION SPECIAL REPORT NO. 61. R. S. Hannan. London, Her Majesty's Stationery Office, 1955. 192p. $1.70.

Scientific and technological problems involved in using ionizing radiations for the preservation of food are reviewed. 441 references. (C.H.)

7425
RADIATION BIOLOGY. VOLUME III. VISIBLE AND NEAR-VISIBLE LIGHT. Alexander Hollaender, ed. New York-Toronto-London, McGraw-Hill Book Co., Inc., 1956. 765p.

The biological effects of visible and near-visible light are reviewed. Topics discussed include energy exchange in photoreactions; electronic structure and excitation of polyenes and porphyrins; generation, control, and measurement of visible and near-visible radiant energy; energy efficiency in photosynthesis; the mechanism of photosynthesis; the absorption, action, and fluorescence spectra of photosynthetic pigments in living cells and in solutions; chlorophyll formation and accumulation in plants; nitrate reduction; phototropism; photoperiodism; seed germination; viscosity, permeability, and protoplasmic streaming; electrical phenomena in vision; invertebrate photoreceptors; and photodynamic action and its pathological effects. (C.H.)

7426
THE OXYGEN EFFECT AND THE MUTATION PROCESS. William K. Baker (Oak Ridge National Lab., Tenn.). pp. 191-200 of MUTATION—Brookhaven Symposia in Biology No. 8, 1956.

Refer also to abstract 7796.

RADIATION HAZARDS AND PROTECTION

7427 HW-25457(Rev.)
Hanford Atomic Products Operation, Richland, Wash.
MANUAL OF RADIATION PROTECTION STANDARDS. Dec. 15, 1954. Changed from OFFICIAL USE ONLY May 10, 1956. 77p. Contract W-31-109-Eng-52. $12.30 (ph OTS); $4.50(mf OTS).

Policies are presented for the control of radioactive materials and radiation hazards at HAPO. (C.H.)

7428 NP-6017(p.99-108)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON DISPOSAL AND DISPERSAL OF ATOMIC WASTES. p.99-108 of THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 10p.

No deleterious effect on the public has been found due to radioactive wastes. Conclusions are outlined regarding the status of waste disposal in the future. (C.H.)

7429 TID-7513(Pt. I)
Division of Reactor Development, AEC.
FOURTH ATOMIC ENERGY COMMISSION AIR CLEANING CONFERENCE HELD AT ARGONNE NATIONAL LABORATORY, NOVEMBER 1955. 320p. $1.50(OTS).

Air cleaning operations, equipment, and research projects at AEC and associated installations are described. (C.H.)

7430
EFFECT OF CORTISONE ON THE RADIATION REACTION OF THE RAT LUNG. Reynold F. Brown (Univ. of California School of Medicine, San Francisco). Am. J. Roentgenol. Radium Therapy Nuclear Med. 75, 796-806(1956) Apr.

The effect of cortisone on the radiation reaction of the rat was studied during a ninety-day period after irradiation (3,000 r to the right lung in one exposure) by means of mortality, body-weight changes, serial roentgenograms of the lungs, and postmortem macroscopic and microscopic examinations of the lungs. Cortisone did not significantly increase or decrease survival. (auth)

7431
UTILISATION OF BARRIER CREAMS IN ATOMIC ENERGY PLANTS. G. S. Towler (U. K. Atomic Energy Authority). Atomics 7, 88-90(1956) Mar.

The use of a system of barrier creams as a protective agent in atomic energy installations is one of many examples of the building-up of a new technique for handling materials

possessing physical properties not commonly found in the chemical industry. The method developed was designed to cope with a specific problem, and the approach employed was empirical in character. (auth)

7432

TEMPERATURE MEASUREMENTS ON MICE IRRADIATED WITH VERY HIGH X-RAY INTENSITIES. W. S. Moos (Univ. of Illinois, Chicago). Experientia 12, 101-2(1956) Mar.

7433

CYTOLOGICAL IDENTIFICATION OF RADIATION-CHIMAERAS. C. E. Ford, J. L. Hamerton, D. W. H. Barnes, and J. F. Loutit (Atomic Energy Research Establishment, Harwell, Berks, England). Nature 177, 452-4(1956) Mar. 10.

Male mice were exposed to 950 r x radiation and then injected intravenously with a cell suspension prepared from the spleens of infant mice heterozygous for a marker chromosome. All animals killed from 5 to 49 days after injection showed the presence of the marker chromosome in dividing cells of the bone morrow prepared by the Feulgen-squash technique for histological examination. It is concluded that replacement of the hosts' bone marrow by injected donor-cells was effectively complete. It is postulated that cellular repopulation is the mechanism by which spleen and other tissues bring about their therapeutic effects in radiation injury. However, the possibility of simultaneous operation of a humoral factor is not excluded. Possible applications of the chromosome marker technique as a biological tracer are briefly discussed. (C.H.)

7434

THE PROBLEM OF CONTROL OF HAZARDS FROM STRAY RADIATIONS. Joe W. Howland (Univ. of Rochester School of Medicine and Dentistry, N. Y.). N. Y. State J. Med. 56, 668-71(1956) Mar. 1.

7435

RADIOACTIVE FALLOUT AND RADIOACTIVE STRONTIUM. W. F. Libby (U. S. Atomic Energy Commission). Science 123, 657-60(1956) April.

The contribution to environmental radioactivity of radioactivity due to fall-out following the explosion of nuclear weapons is reviewed. Mechanisms by which Sr^{90} might be expected to enter the human body are discussed in detail. Data from nuclear weapons tests form the basis for the conclusion that the main part of the radioactivity from high-yield weapons dissipates in the stratosphere, but the small but very significant part that falls out within a few hundred miles of the site of the explosion of weapons fired on the surface constitutes a very real hazard. The weapons tests are therefore conducted with great attention to the dangers and every effort made to protect against misadventure. These local precautions should be entirely adequate and the worldwide health hazards from the present rate of testing are considered insignficant. (C.H.)

Refer also to abstracts 7488 and 8037.

RADIOGRAPHY

7436 AMRL-173

Army Medical Research Lab., Fort Knox, Ky.

X-RADIOGRAPHY WITH BETA-EMITTING ISOTOPES. J. G. Kereiakes and A. T. Krebs. Dec. 20, 1954. 13p. Project 6-59-08-014.

The possibility of using β-emitting isotopes for x radiography was investigated. Radiographs of rat body and human hand made with a weak $Sr^{90}-Y^{90}$ source showed good contrast and definition in spite of unfavorable focal spot size. (C.H.)

7437

THE FUNDAMENTALS OF RADIOAUTOGRAPHY. William P. Norris and Lois A. Woodruff (Argonne National Lab., Lemont, Ill.) Ann. Rev. Nuclear Sci. 5, 297-326(1955).

RADIOTHERAPY

7438

PRELIMINARY REPORT ON THE CLINICAL USE OF THE MEDICAL RESEARCH COUNCIL 8 MeV LINEAR ACCELERATOR. R. Morrison, G. R. Newbery, and T. J. Deeley (Hammersmith Hospital, London). Brit. J. Radiol. 29, 177-86(1956) April.

A review of the first year's clinical work on the 8 Mev linear accelerator is given. The biological efficiency of pulsed 8 Mev x rays is discussed. The absorption in tissue of 250 kv and 8 Mev x rays is compared and the clinical applications of megavoltage therapy surveyed. The planning techniques employed and field arrangements used for the 257 patients treated in the year's work are described. (auth)

7439

ROTATION THERAPY WITH A 2 MeV VAN DE GRAAFF GENERATOR. K. F. Orton (Sheffield National Centre for Radiotherapy, Sheffield, England). Brit. J. Radiol. 29, 186-92(1956) April.

The paper deals with the rotating table and auxiliary equipment which have been installed on a 2 Mev Van de Graaff generator. The equipment is designed primarily for cylindrical volume therapy although it could be used for conical volume therapy with a reduced dose-rate. The method of the localisation of tumours is described together with an account of the methods used to position the tumour axis on the axis of rotation. The calculation of dosage is discussed and experimental work confirming the method of calculation is reported. The unit which has been designed to control the treatment is described and one typical treatment schedule is mentioned. (auth)

7440

DOSAGE DATA FOR 4,000,000 VOLT X RAYS. D. Greene and F. W. Tranter (Christie Hospital, Manchester 20, England). Brit. J. Radiol. 29, 193-6(1956) April.

Depth dose data and isodose curves for normal and oblique incidence have been measured for radiation from a 4 Mev linear accelerator. The results confirm and extend published data at this energy. (auth)

7441

USE OF HIGH VOLTAGES AND LARGE MASSES OF RADIO-ELEMENTS IN THE TREATMENT OF CANCER IN GENERAL. J. Maisin, H. Maisin, and J. Keusters. J. belge radiol. 39, No. 1, 88-126(1956). (In French)

7442

BISMUTH-206, A PURE GAMMA-EMITTER FOR THERAPY. J. Th. van der Werff. J. belge radiol. 39, No. 1, 133-45 (1956). (In English)

A report is given about the properties and the therapeutical applications of Bi^{206} which is a pure γ emitter. After a discussion about the advantage of a γ emitting radioisotope over β or β and γ emitting isotopes, a review is given of the physical properties. These show that Bi^{206}, when injected into a tumour region, could replace the insertion of radium needles, if it would remain in such an area for a long time. This could be achieved by mixing a solution of Bi^{206} citrate with a 5% charcoal suspension. In this form the mixture can be used for the treatment of tumours which are difficult to approach by other methods. The technics of handling this radioactive suspension are discussed in detail and some applications on patients are described. Another important application has been found in the treatment of diseases of

the reticulo-endothelial system by intravenous injections of the bismuth-charcoal suspension. Especially aleukemic forms of lymphatic leukemia can be treated in this way, because the healthy blood is not seriously affected by this treatment. With other diseases of the reticulo-endothelial system, like Hodgkin's disease, the treatment with Bi^{206} can be used as a supplementary treatment after local roentgen-irradiation. (auth)

Refer also to abstract 7881.

TOXICOLOGY STUDIES

7443 UR-454

Rochester, N. Y. Univ. Atomic Energy Project.
ACUTE INHALATION TOXICITY OF LITHIUM HYDRIDE. C. J. Spiegl, J. K. Scott, H. Steinhardt, L. Leach, and H. C. Hodge. June 20, 1956. 11p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

Rats, mice, guinea pigs, and rabbits were exposed to atmospheres containing lithium hydride. A total of 135 animals inhaled concentrations of from 5 to 55 mg Li/m^3 for one day. Fifty-three animals breathed 5 mg Li/m^3 for one week. The toxic manifestations of LiH were ascribed to the alkalinity of the hydrolysis product, LiOH. All concentrations caused coughing and sneezing. High levels produced irritation of the eyes, some sloughing of mucosal epithelium, and occasional destruction of fur and forepaws. Despite the corrosive action of LiH, no systemic toxicity was noted. Growth curves were normal; the mortality rate of 6% was believed to have been unrelated to exposure; and no chronic symptoms were seen during a post-exposure period of up to five months. (auth)

7444

REMOVAL OF RADIOELEMENTS FROM THE MAMMALIAN BODY. Jack Schubert (Argonne National Lab., Lemont, Ill.) Ann. Rev. Nuclear Sci. 5, 369-412(1955).

The development of methods for treating radioactive poisoning in animals is discussed. Complexing agents and colloidal ion-exchange carriers are examined as agents for removing radioisotopes from the body. 93 references. (C.W.H.)

7445

INHALATION TOXICOLOGY OF CHLORINE TRIFLUORIDE. II. Chronic Toxicity. Henry J. Horn and Robert J. Weir (Hazleton Laboratories). Arch. Ind. Health 13, 340-5 (1956) April.

Dogs and rats were exposed to an average concentration of 1.17 ppm of chlorine trifluoride for a total period of six months on a six-hour-per-day, five-day-per-week basis. Signs of toxicity in the dogs consisted of coughing, sneezing, rhinorrhea, lacrimation, salivation, panting-type respiration, and occasionally coughing up a frothy fluid. After about two months both dogs had recurrent bouts of pneumonia, which resulted in the death of one dog on the 115th day of the experiment. Signs of toxicity were not so pronounced in the rats, but after several weeks they had a blood-tinged discharge about their nares and eyes. Furthermore, they appeared depressed and unthrifty. During the course of the experiment six rats died, one of which was killed accidentally. The pathological findings, gross and microscopic, of the surviving experimental rats were unquestionably severer than those of the control and indicated pulmonary irritation. In those experimental rats which died there was pulmonary edema and brocho-pneumonia. The experimental dog which died had purulent bronchitis and pulmonary abscesses, while the surviving dog had alveolar hemorrhage, interstitial edema, and irritation. Gross and microscopic pathology of the control dogs was not remarkable. (auth)

7446

SOME PHARMACOLOGIC EFFECTS OF DIBORANE. Anne M. Kunkel, Edmumd F. Murtha, Aili H. Oikemus, Dorothy E. Stabile, J. Palmer Saunders, and J. Henry Wills. (Army Chemical Center, Md.). Arch. Ind. Health 13, 346-51(1956) April.

The primary effect in poisoning by diborane appears to be the production of pulmonary edema. The earliest sign observed in dogs and rabbits during exposure was respiratory embarrassment. This was followed by a slight fall in blood pressure, an increase in activity of the smooth muscle of the intestine, and an increase and subsequent diminution in cortical activity. The latter effects were possibly associated with anoxia. Bradycardia occurred late in poisoning and was followed terminally by ventricular fibrillation or complete disappearance of ventricular activity. It appears that none of the drugs tested prophylactically possesses any significant value in preventing diborane intoxication. (auth)

TRACER APPLICATIONS

7447 HW-42200

Hanford Atomic Products Operation, Richland, Wash.
STUDIES OF METABOLIC TURNOVER WITH TRITIUM AS A TRACER. V. THE PREDOMINANTLY NON-DYNAMIC STATE OF BODY CONSTITUENTS IN THE RAT. Roy C. Thompson and John E. Ballou. Mar. 26, 1956. 27p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Rats exposed to a constant level of tritium oxide in body water from conception to age six months were subsequently sacrificed at time intervals extending to 300 days. Another series of animals, similarly exposed for a period of 124 days after attaining maturity, were subsequently sacrificed at intervals extending to 360 days. Organically bound tritium was determined in various organs, tissues, and compound fractions. Results are discussed. (auth)

7448 UCLA-374

California. Univ., Los Angeles. Atomic Energy Project.
EFFECTS OF CALCIUM AND STRONTIUM ON PLANT UPTAKE OF Sr^{90} AND STABLE STRONTIUM FROM NUTRIENT SOLUTIONS AND SOILS. E. M. Romney, G. V. Alexander, G. M. Le Roy, W. A. Rhoads, J. W. Neel, and K. H. Larson. July 15, 1956. 61p. Contract AT-04-1-GEN-12. $0.40(OTS).

Experiments were conducted under glasshouse conditions to study the effects of Ca and Sr on the uptake of radioactive and stable Sr by bean plants grown in various nutrient solutions and soils. Strontium^{90} was used as a tracer. (C.H.)

7449 USNRDL-TR-75

Naval Radiological Defense Lab., San Francisco.
RELATIVE EFFECTIVENESS OF PHENYLHYDRAZINE TREATMENT AND HEMORRHAGE IN THE PRODUCTION OF AN ERYTHROPOIETIC FACTOR. E. M. Jacobsen, A. K. Davis, and E. L. Alpen. Jan. 27, 1956. 18p. Project NM 006 015.02.

Plasma extract from rabbits made severely anemic by phenylhydrazine was tested comparatively for erythropoietic activity in intact rats with plasma extract similarly prepared from rabbits made equally anemic by pair bleeding. Reticulocytosis was present in both, but was most intense in the phenylhydrazine-treated group. Moreover, a variation in plasma extract potency occurred within the latter group. Only plasma fraction from those animals showing definite liver damage evoked significant increase in blood volume and red cell mass as measured by the Fe^{59} cell dilution technique. These changes were in addition to an elevated

RBC count, hematocrit, and an intense reticulocytosis, thus ruling out hemoconcentration and placing greater emphasis upon red cell mass measurement rather than reticulocyte levels as a more reliable quantitative criterion of anemia plasma filtrate effectiveness in evoking erythropoietic response. (auth)

7450 AEC-tr-2542
EXPERIMENTS WITH RADIOACTIVE INDOLEACETIC ACID TO TEST THE SO-CALLED DIVERSION OF THE GROWTH HORMONE STREAM BY LIGHT. Erwin Bunning, Hans-J. Reisener, Friedrich Weygand, Helmut Simon, and Johann Friedrich Klebe. Translated by I. A. Warheit from Z. Naturforsch. 11b, 363-4(1956). 3p.

7451
ABSORPTION AND DISTRIBUTION OF RADIO-TUNGSTATE IN BONE AND SOFT TISSUES. Arthur W. Wase (Hahnemann Medical College, Philadelphia, Pennsylvania). Arch. Biochem. Biophys. 61, 272-7(1956) April.

7452
THE RELATIVE IMPORTANCE OF ANDROGEN AND ESTROGEN IN THE SELECTIVE UPTAKE OF Zn^{65} BY THE DORSOLATERAL PROSTATE OF THE RAT. Samuel A. Gunn and Thelma Clark Gould (Univ. of Miami School of Medicine, Coral Gables, Fla.). Endocrinology 58, 443-52 (1956) Apr.

7453
IODINE METABOLISM IN SURVIVING HUMAN THYROID SLICES MAINTAINED IN A MEDIUM OF CONSTANT COMPOSITION. George D. Molnar, F. Raymond Keating, Jr., Alan L. Orvis, and A. Albert (Mayo Clinic and Foundation, Rochester, Minn.). Endocrinology 58, 501-11(1956) Apr.

7454
SALIVARY AND THYROIDAL RADIOIODIDE CLEARANCES OF PLASMA IN VARIOUS STATES OF THYROID FUNCTION. Karl Fellinger, Rudolf Höfer, and Herbert Vetter (Univ. of Vienna, Austria). J. Clin. Endocrinol. and Metabolism 16, 449-62(1956) Apr.

In 10 patients with various states of thyroid function the radioiodide clearance of plasma by the parotid gland was observed to be independent of thyroidal function and to average 46 ml per min. The ratio of salivary to plasma radioiodine concentration is apparently determined by the plasma concentrations of radioiodide and protein-bound radioiodine, and reflects thyroidal function only in so far as the plasma concentrations do. In addition to all the factors which determine the plasma concentrations, the saliva/plasma ratio is influenced by the rate of salivary flow and by the extent of dilution of serous by mucous saliva. In contrast to the salivary radioiodide clearance, the thyroidal radioiodide clearance was found to decrease significantly during the early phase of iodide distribution. This observation can be explained by the hypothesis that thyroidal uptake is a two-rate function with, in normal cases, the rate of iodine binding being slower than the rate of iodide trapping. Double estimations of the thyroidal clearance with I^{132} have confirmed previous reports that iodine metabolism in its early phase may be subject to considerable daily variations. (auth)

7455
DETERMINATION OF PROTEIN-BOUND RADIOIODINE WITH AN ANION EXCHANGE RESIN. Leslie Zieve, William C. Vogel, and Alvin L. Schultz (V. A. Hospital and Univ. of Minnesota, Minneapolis). J. Lab. Clin. Med. 47, 663-8(1956) Apr.

Systematic loss of protein-bound radioiodine has been observed with the standard procedure utilizing protein precipitation and washing with trichloroacetic acid (TCA). Approximately 3% of the protein-bound radioactivity is lost with each wash, with a total loss of about 15% with the usual procedure. By the end of the second TCA wash, over 90% of the radioactivity in the wash solution is butanol-extractable. Passage of plasma through a column of Amberlite resin removes inorganic iodine efficiently. Protein-bound iodine is also lost, averaging approximately 4%. This is partially compensated for by the loss of a small amount of water by the plasma in passing through the resin column, the protein concentration of the effluent increasing by about 1 to 2%. The first 3 cm of the 21 cm resin column remove 80 to 90% of the radioactivity retained by the column, and the last 18 cm remove 5 to 20%. One passage of plasma through a resin column yields protein-bound radioiodine values that differ by an average of 4% from those obtained with dialysis. Conversion ratios based upon resin values were essentially similar to those obtained with dialysis, being on the average 1% lower. Passage of plasma through one resin column is recommended as a simple and effective way of removing inorganic I^{131}, no matter how large the amount of radioactivity being processed. (auth)

7456
METABOLISM CAGE FOR RATS. Lloyd J. Roth (Univ. of Chicago). Nucleonics 14, No. 4, 104(1956) Apr.

An all-glass metabolism cage for rats is described. It has been used for experiments in which the excretion patterns of C^{14} were studied. (B.J.H.)

7457
THE METABOLISM OF Ac^{227} AND ITS DAUGHTERS Th^{227} AND Ra^{223} BY RATS. J. E. Campbell, E. S. Robajdek, and D. S. Anthony (Mound Laboratory, Miamisburg, Ohio). Radiation Research 4, 294-302(1956) April.

7458
FURTHER STUDIES ON THE GASTROINTESTINAL ABSORPTION OF PLUTONIUM. Maurice H. Weeks, Joseph Katz, Willa D. Oakley, John E. Ballou, Lynn A. George, Leo K. Bustad, Roy C. Thompson, and Harry A. Kornberg (General Electric Company, Richland, Washington). Radiation Research 4, 339-47(1956) April.

7459
THE UPTAKE OF RADIOSTRONTIUM BY CERTAIN TYPE CROPS FROM CALCAREOUS SOILS. W. H. Fuller and W. J. Flocker. Tucson, Arizona Agricultural Experiment Station, Univ. of Arizona, Technical Bulletin 130, Oct. 1955. 32p.

Refer also to abstract 7907.

WASTE DISPOSAL

7460 NP-6017(p.71-84)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION ON OCEANOGRAPHY AND FISHERIES. p.71-84 of THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 14p.

Radioactive contamination of the ocean due to nuclear weapons tests over or in the sea, the disposal of radioactive wastes from nuclear power plants in the sea, and the use of radioactive substances in increasing our understanding of the oceans and of the creatures that live in the sea, is discussed. Recommendations are presented for a long-range program of research on the physics, chemistry, and geology of the sea and on the biology of marine organisms. (C.H.)

CHEMISTRY

7461 AD-94687
Boston Univ. Optical Research Lab.
PHOTOGRAPHIC MONOBATHS FOR RAPID PROCESS-

ING. PART II. Harry S. Keelan. Mar. 1956. 18p. Contract AF33(616)-3405.

Previous to 1953, combined developing and fixing solutions (monobaths) were generally regarded as possessing certain inherent disadvantages including instability, uneven development, excessive softening of the emulsion, and loss of speed. Subsequently, monobaths were developed that eliminated all of these disadvantages but the loss of speed. Further studies have now remedied even this loss of speed. The use of an additive, triaminophenol trihydrochloride, has permitted speeds and gammas equal to those obtained by conventional processing in D-19. (auth)

7462 AERE-C/M-1884

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE EFFECT OF TIME AND TEMPERATURE UPON THE GROWTH OF PARTICLES OF SODIUM URANATE SLURRIES IN MOLTEN CAUSTIC SODA. J. R. Findlay, J. N. Gregory, and G. Weldrick. Mar. 1956. 9p. (RCTC-P/65).

The change in particle size as a function of time, temperature and stirring speed has been investigated for slurries of sodium uranate in molten caustic soda between 400 and 800°C. At 400 and 500°C no change was observed up to 2,500 hr. At 600°C a mean particle size of 7.5μ was found after 2,500 hr and at 800°C the rate of growth was extremely rapid reaching 30μ in 70 hr. (auth)

7463 CCC-1024-TR-179

Oklahoma Agricultural and Mechanical Coll., Stillwater.

THE DETERMINATION OF CARBON, HYDROGEN AND NITROGEN IN ORGANOBORON COMPOUNDS AND OF BORON AND CARBON IN BORON CARBIDES. P. Arthur and R. Annino. Mar. 14, 1956. 33p. For Callery Chemical Co. Contract NOa(s) 52-1024-c.

Micro dry combustion procedures were modified to permit better determinations of C in organoboron compounds, of N_2 in amine–boron trifluoride complexes, and of B and C simultaneously in boron carbides. Incomplete combustion was overcome by a final period of combustion at about 1000°C. The use of a double-length packing in a longer combustion tube and of a slightly decreased rate of burning permitted satisfactory application of the Dumas nitrogen procedure to analysis of amine–BF_3 complexes. Boron and carbon in boron carbides were determined simultaneously by burning at 1400°C in an induction furnace. The carbon was measured by absorption of the resulting CO_2 on Ascarite and B by titration of the boric oxide formed. (auth)

7464 MCC-1023-TR-152

Ohio State Univ. Research Foundation, Columbus.

KINETICS OF DECOMPOSITION AND OXIDATION OF DERIVATIVES OF BORON HYDRIDES. James E. Coleman, Joseph A. Lovinger, and Robert C. Petry. June 16, 1955. 34p. [For Olin Mathieson Chemical Corp. Contract NOa(s)-52-1023-c].

The pyrolysis of trimethylborane proceeds at a measurable rate in the temperature range 550° to 610°C with an increase in pressure, forming dark-colored solids, low boiling liquids, and gases not condensed by liquid nitrogen. The oxidation of trimethylborane by oxygen at 0°C is nonexplosive at low pressures but proceeds at a rate too fast for convenient measurement, after an induction period. At higher pressures, explosion occurs; the explosion limits depend upon the pressure and the mixture ratio. The oxidation below the explosion limit produces a product of molecular weight corresponding to a mole for mole reaction of oxygen and trimethylborane. This product is a strong oxidizing agent, giving the same tests shown by hydroperoxides. (auth)

7465 MCC-1023-TR-193

Syracuse Univ., N. Y.

THERMODYNAMIC PROPERTIES OF MAGNESIUM DIBORIDE AND MAGNESIUM TETRABORIDE. Final Report. David White and Robinson M. Swift. Jan. 1956. 41p. [For Olin Mathieson Chemical Corp. Contract NOas 52-1023-c].

The heat capacities of magnesium diboride (MgB_2) and magnesium tetraboride (MgB_4) were measured in the temperature range 18 to 305°K. The entropy at 298.16°K of MgB_2 is 8.60 ± 0.04 cal/deg/mole; the entropy at 298.16°K of MgB_4 is 12.41 ± 0.06 cal/deg/mol. Between 20 and 70° the heat capacity of MgB_2 varies as $T^{3.5}$ while that for MgB_4 varies as $T^{2.6}$. No relationship was found among the vibration frequencies characteristic of the two compounds. An apparatus was constructed to measure the heat capacity of solids at low temperatures. (auth)

7466 MCC-1023-TR-194

Michigan State Univ., East Lansing.

GASEOUS DIFFUSION OF DIBORANE, HYDROGEN, AND NITROGEN (thesis). Ralph E. Johnson. Oct. 1955. 117p. [For Olin Mathieson Chemical Corp. Contract NOas 52-1023-c].

7467 NP-6034

Pennsylvania State Univ., University Park. Coll. of Mineral Industries.

ON THE PROPERTIES OF SOME MIXTURES OF FUSED SALTS. Technical Report No. 69. Tormod Forland. June 1956. 117p. Contract N6-onr-269, Task Order 8.

Properties and particularly the thermodynamic properties, of mixtures of fused salts on the basis of various structural models for the fused mixtures are described. Four idealized models were considered, and thermodynamic functions were derived on this basis. For mixtures of fused salts containing monovalent and divalent cations the available experimental material indicates at least in some cases, that the fused systems may be described as a random mixture of the two kinds of cations, the charge being insignificant for the entropy of mixing. Further, the available experimental material indicates that the energy of such systems may be expressed as a sum of energies attributed to each pair of closest neighbors and to each pair of next nearest neighbors of the various ions in the mixture. The same description may be less appropriate to mixtures containing anions with different number of charges particularly when the mixture contains small anions with a low charge together with large anions with a high charge. For such a system it seems reasonable to assume that the number of available positions for the different anions will depend both on the number of anions and on the number of charges they carry. (auth)

7468 NP-6035

Harvard Univ., Cambridge, Mass. Mallinckrodt Chemical Lab.

PART I. THE RELATIVE STABILITIES OF SOME MOLECULAR ADDITION COMPOUNDS OF BORON. PART II. ADDITION OF BORINE TO CARBON–CARBON DOUBLE BONDS: THE EFFECT OF BORON HYDRIDE ON FLUORINATED ETHYLENES (thesis). W. A. G. Graham and F. G. A. Stone. July 1956. (Includes reprint: ADDITION OF BORINE TO CARBON–CARBON DOUBLE BONDS: THE EFFECT OF BORON HYDRIDE ON FLUORINATED ETHYLENES. F. G. A. Stone and W. A. G. Graham. Chemistry & Industry, p.1181-3(1955)). 35p. Contract Nonr-1866(13).

Using BF_3 as a reference acceptor molecule, the methyl derivatives of O, S and Se have an order of electron-pair donor power: O > S > Se. With both borine and trimethylborine, however, the order of co-ordination is S > Se, O. Moreover, the adducts $(CH_3)_2S \cdot BH_3$ and $(CH_3)_2Se \cdot BH_3$ are more stable than their BF_3 analogues. The weakness of BF_3 as an acid was further demonstrated by its quantita-

tive displacement by diborane from the complex $(CH_3)_3P \cdot BF_3$. In Group Vb the order of co-ordination of methyl derivatives towards BH_3 is apparently P > N > As > Sb, compared with the order N > P > As > Sb shown by all other Group IIIb acceptor molecules so far investigated. Possible explanations for these observations are discussed. (auth)

7469 NYO-3958

Tufts Univ., Medford, Mass.

SOLID-LIQUID EQUILIBRIUM IN THE LITHIUM–LITHIUM HYDRIDE SYSTEM. I. APPARATUS; MELTING AND FREEZING POINTS OF LITHIUM HYDRIDE AND LITHIUM HYDRIDE-RICH MIXTURES. Period Covered: May 2, 1954 to December 1, 1955. Charles E. Messer, Edwin B. Damon, and P. C. Maybury. Dec. 1, 1955. 19p. Contract AT(30-1)-1410. $0.20(OTS).

An apparatus for the determination of melting and freezing temperatures of LiH, and mixtures containing LiH, is described. This apparatus provides for simultaneous observation of H_2 dissociation pressures. The freezing point of stoichiometric LiH is 684 ± 1°C. Removal of H_2 from LiH causes lowering of the freezing point down to a constant value of 680.5 ± 0.5°C at compositions below $LiH_{0.98}$. (auth)

7470 NYO-3959

Tufts Univ., Medford, Mass.

SOLID-LIQUID EQUILIBRIUM IN THE LITHIUM–LITHIUM HYDRIDE SYSTEM. II. FREEZING POINTS OVER THE COMPOSITION RANGE 5 TO 90 PER CENT LITHIUM HYDRIDE. Period Covered: December 1, 1955 to June 1, 1956. Charles E. Messer and Regina A. Seales. June 14, 1956. 14p. Contract AT(30-1)-1410. $3.30(ph OTS); $2.40(mf OTS).

Earlier measurements of the freezing points of mixtures of lithium and lithium hydride varying in composition from $LiH_{0.998}$ to $LiH_{0.918}$ have been extended through lower hydrogen contents down to $LiH_{0.056}$. The curve of freezing point vs. composition shows a decrease in freezing point with decreasing hydrogen content over the two-phase "plateau" region. The slope, very small at high hydrogen contents, gradually increase, then increases rapidly below $LiH_{0.17}$ which may be the composition of the equilibrium metallic phase. A dissociation pressure isotherm at 725°C. is also reported. Results are discussed in terms of the purity and history of the sample. (auth)

7471 AEC-tr-2480

PHYSICO-CHEMICAL INVESTIGATION OF THE FUSED $AgNO_3$–KNO_3 SYSTEM. V. D. Poljakov. Translated from Izvest. Sektora Fiz. Khim. Anal. Inst. Obshcheĭ Neorg. Khim. Akad. Nauk S.S.S.R. 26, 147-55(1955). 16p.

The system $AgNO_3$–KNO_3 has been studied in a fused state by density, electric conductivity and viscosity methods. Results obtained showed that the incongruently melting compound $2AgNO_3 \cdot KNO_3$ found by A. Usov is confirmed by the extremes on the viscosity and electric conductivity isotherms and their reciprocal properties. The viscosity and electric conductivity isotherms respectively show the presence of a formation of a chemical compound with the composition $AgNO_3 \cdot KNO_3$. The density isotherms of the system show that this property greatly decreases in fusions of their mixtures. The curve of the molecular volumes shows a distinct maximum within the limits of 33% KNO_3; this is the first case for such objects of study. (auth)

7472 AEC-tr-2481

PHYSICO-CHEMICAL INVESTIGATION OF THE FUSED $AgNO_3$–HgI_2 SYSTEM. V. D. Poljakov. Translated from Izvest. Sektora Fiz. Khim. Anal. Inst. Obshcheĭ Neorg Khim. Akad. Nauk S.S.S.R. 26, 191-7(1955). 16p.

The following properties of the fused $AgNO_3$–HgI_2 system have been studied: density, electric conductivity and viscosity. The chemical compounds with the composition $2AgNO_3 \cdot HgI_2$ and $AgNO_3 \cdot HgI_2$, discovered by the fusion method, have been fully confirmed on the specific and molecular electric conductivity isotherms in the form of a sharp minimum on the curves. The viscosity isotherms have shown the presence of two maxima, which confirm the formation of a chemical compound of the above mentioned composition. Due to a complex chemical interaction in the system a condensation of the 50% fusion composition occurred which was reflected in a density increase of 11.72% in the average additive density of this fusion. A more exact polytherm of the specific electric conductivity for mercuric iodide was found. The mercuric iodide in the fusion had a negative temperature coefficient of the electric conductivity. (auth)

7473 AEC-tr-2484

ELECTRIC CONDUCTIVITY OF THE BINARY $LiNO_3$–$RbNO_3$ AND $AgNO_3$–$RbNO_3$ SYSTEMS IN FUSIONS. P. I. Protsenko. Translated from Izvest. Sektora Fiz. Khim. Anal. Inst. Obshcheĭ Neorg. Khim. Akad. Nauk S.S.S.R. 26, 173-9(1955). 13p.

The following binary systems were investigated by the method of electric conductivity: lithium nitrate-rubidium nitrate, and silver nitrate-rubidium nitrate, within the temperature interval of 180 to 320°. The congruently melting chemical compounds $RbNO_3 \cdot AgNO_3$ and $RbNO_3 \cdot LiNO_3$ and the incongruently melting compound $2RbNO_3 \cdot AgNO_3$ which form in these systems are not reflected on the isotherms of the specific electric conductivity and are not confirmed by the curves of the absolute and relative temperature coefficients. It was established that the isotherms of the specific electric conductivity of the components of the binary systems have negative deflections from the additivity and rise uniformly, almost parallel from the less conductive to the more conductive components. It was shown that the complex compounds of the binary salt type formed by the nitrates of the metals of the first and second groups of the periodic system dissociate into "free ions" in fusions. (auth)

7474 AEC-tr-2501

THE HEAT CONDUCTIVITY OF AQUEOUS SOLUTIONS OF STRONG ELECTROLYTES. L. Riedel. Translated from Chem. Ing. Tech. 23, 59-64(1951). 22p.

A critical comparison of present test results on hand for the conductivity of heat of aqueous solutions of salts, acids, and bases is made and represented in a uniform form. On the basis of simple theoretical observations it is possible to estimate reliably this important value for numerous solutions which have not yet been investigated. (auth)

7475 AEC-tr-2515

THE INFLUENCE OF ADSORPTION PHENOMENA ON THE OXIDATION OF METALS AT HIGH TEMPERATURES. H. J. Engell and K. Hauffe. Translated from Metall 6, 285-91(1952). 17p.

"Chemisorption" (activated adsorption under the action of chemical forces between the surface of the absorbent and absorbate) of oxygen at the oxygen layer is discussed. The connection between disorder phenomena in oxide cover layers and chemisorption; the effect of chemisorption on the mechanism of formation of thick (10^{-4} cm) scale layers, and the effects of alloy additions are analyzed. Adsorption and marginal layer formation effects on the kinetics of formation of thin (10^{-6} to 10^{-5} cm) cover layer and the phase boundary reactions vs. movement processes are studied to determine the velocity. Diagrams of chronological oxidation of Zn at 100 mm mercury pressure at different temperatures and the growth of ZnO layer at various oxygen pressures at 400°C according to parabolic oxidation law are given. (R.V.J.)

7476 AEC-tr-2527

EQUILIBRIUM REACTION BETWEEN CALCIUM, MAGNESIUM, AND THEIR FUSED CHLORIDES. Hélène Ostertag. Translated by John Hinkebein from Compt. rend. 240, 1085-7(1955). 5p.

The equilibrium reaction $Ca + MgCl_2 \rightleftharpoons Mg + CaCl_2$ was studied at 860 and 1000°C. The K_p constants which were found were less by 10^2 than the calculated values. It was found that for metal phases containing less than 40 at. % calcium, the solubility of calcium in the salt phase is constant. A satisfactory explanation of this phenomenon has not been found. In course of a general work having as its object the study of the reactions between salts and fused alkaline earth metals, the equilibrium of $Ca + MgCl_2 \rightleftharpoons Mg + CaCl_2$ at 860 and 1000°C was examined. (auth)

7477 AERE-Lib/Trans-664

THE OVERVOLTAGE OF HYDROGEN ON ARSENIC CATHODES AND THE ELECTROMOTIVE BEHAVIOUR OF ARSINE. G. Grube. (From experiments of H. Kleber). Translated by F. Hudswell from Z. Elektrochem. 30, 517-23(1924). 15p.

Arsine occurs as an intermediate product in the electrolytic evolution of H_2 at arsenic cathodes, in both acid and alkaline solutions. Current densities have been tabulated. Electrodes used were Cu-foil coated with As and platinized platinum. (W.L.H.)

7478 AERE-Lib/Trans-684

THE MÜLHEIM PROCESS FOR THE ATMOSPHERIC PRESSURE POLYMERISATION OF ETHYLENE. K. Ziegler. E. Holzkamp, H. Breil, and H. Martin. Translated by R. S. Forsyth from Angew. Chem. 67, 541-7(1955). 16p.

A process has been developed where C_2H_4 can be rapidly polymerized to a true plastic, at atmospheric pressure, or at fractions of an atmosphere, with complete conversion. Catalysts are also discussed. (W.L.H.)

7479 TT-573

ELEMENTARY REACTIONS OF ATOMIC OXYGEN WITH ETHANE. (Elementarnye reaktsii atomnogo kisloroda s etanom). L. I. Avramenko and R. G. Kolesnikova. Translated by G. Belkov from Doklady Akad. Nauk S.S.S.R. 89, 1037-40(1953). 8p.

7480 TT-578

THE FORMS OF SILICA IN LIQUID SLAG. (O formakh sushchestvovaniia kremnezema v zhidkikh shlakakh). O. A. Esin, L. K. Gavrilov, and B. M. Lepinskikh. Translated by G. Belkov from Doklady Akad. Nauk S.S.S.R., 88, 713-16 (1953). 6p.

The application of the emf method to the investigation of liquid alloys has made it possible to prove experimentally the existence of the stable compounds FeSi and Fe_2P at ~470°C. It is therefore expedient to use this method to find complex anions, for example $Si_xO_y^{z-}$, in molten slags. (auth)

7481

HEATS OF SOLUTION OF THE THORIUM NITRATE HYDRATES IN WATER AND IN CERTAIN ORGANIC SOLVENTS. John R. Ferraro, Leonard I. Katzin, and George Gibson (Argonne National Lab., Lemont, Ill. and Illinois Inst. of Tech., Chicago). J. Inorg. and Nuclear Chem. 2, 118-24(1956) Feb.

Heats of solution of $Th(NO_3)_4 \cdot 5H_2O$ and $Th(NO_3)_4 \cdot 4H_2O$ in H_2O and in a number of oxygenated organic solvents have been measured. The relative values of the heats of solution are found approximately to parallel the base strengths of the solvents as established by previously reported heat-of-solution measurements for 2:1 salts, and by other established criteria. (auth)

7482

REACTIONS OF SODIUM METAL WITH AROMATIC HYDROCARBONS. Donald E. Paul, David Lipkin, and S. I. Weissman (Washington Univ., St. Louis). J. Am. Chem. Soc. 78, 116-20(1956) Jan. 5.

The stoichiometry, optical absorption spectra, and electrical conductivity of the products of the reaction of metallic Na with aromatic hydrocarbons in tetrahydrofuran solution were studied. The results indicate that products containing one mole of Na per mole of hydrocarbon are formed, in agreement with the conclusions arrived at by paramagnetic resonance absorption measurements. A relationship was found between the absorption spectra of reaction products and their parent hydrocarbons. The absorption spectra also were used as an analytical tool for the study of equilibria involving pairs of aromatic hydrocarbons and their corresponding negative ions. The results of these measurements give the following order of increasing electron affinities: benzene ≪ phenanthrene < naphthalene < anthracene, naphthacene. A mechanism is proposed for the reaction of a negative ion hydrocarbon free radical with various reactants (i.e., carbon dioxide, water). (auth)

7483

MOLECULAR REARRANGEMENTS. VI. THE DEHYDRATION OF cis- AND OF trans-2-PHENYLCYCLOHEXANOL. Howard J. Schaeffer and Clair J. Collins (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 78, 124-33(1956) Jan. 5.

The dehyration of cis-2-phenylcyclohexanol-2-C^{14} (Ia) with phosphoric acid has been shown to produce 88% 1-phenylcyclohexene (III) and 2% 3-phenylcyclohexene (IV), in qualitative agreement with previous results. When trans-2-phenylcyclohexanol-2-C^{14} (IIa) was subjected to the same dehydrating conditions there was produced 21% of 1-phenylcyclohexene (III) but only 9% of 3-phenylcyclohexene (IV). These results are in disagreement with those of previous investigators. In addition to III and IV, the trans-alcohol IIa was shown to yield 4-phenylcyclohexene (V), 6%; 1-benzylcyclopentene (VI), 32%, and benzalcyclopentane (VII), approximately 20%. Phenyl migration was shown to occur during the formation of 1-phenylcyclohexene-1,2-C_1^{14} (IIIab) from the trans-alcohol IIa. The same mixture of olefins as was produced from the dehydration of the trans-alcohol IIa was obtained when labeled 3-phenylcyclohexene (IV) was subjected to the dehydration conditions. These results are discussed, in terms of a mechanism which is consistent with the foregoing observations. (auth)

7484

THE USE OF DIFFUSION COEFFICIENTS IN THE MEASUREMENT OF VAPOR PRESSURE. Walter L. Crider (Camp Detrick, Frederick, Md.). J. Am. Chem. Soc. 78, 924-5(1956) Mar. 5.

From the measured rates of evaporation of water vapor from the surface of pure water into pure N_2, H_2, and CO_2, the mutual coefficients of diffusion have been determined at temperatures of 34, 56, and 76°C. By using these values as here determined for the N_2-H_2O system and the measured rates of evaporation of water vapor from solutions of sucrose and from NaCl solutions into N_2, a new method was used to measure vapor pressures of these solutions by making use of the diffusion theory and a transposed form of the diffusion equation. The sucrose solutions ranged in concentration from 1 to 60% sucrose and the sodium chloride solution studies were from 1 to 25% sodium chloride. Vapor pressures were determined for each concentration of solution at 56 and 76°C. (auth)

7485

PREPARATION OF BORON MONOXIDE AT HIGH TEMPERATURES. F. A. Kanda, A. J. King, V. A. Russell, and Walter Katz (Syracuse Univ., New York). J. Am. Chem. Soc. 78, 1509-10(1956) Apr. 5.

Boron monoxide was prepared by heating $B-B_2O_3$ mixtures under vacuum in Ta crucibles for 2 hr at 1350°C. Yields of

65% were obtained. X-ray diffraction patterns of the oxide showed only amorphous rings. (C.W.H.)

7486

DIFFUSION COEFFICIENTS FOR AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AND BARIUM CHLORIDE. V. Vitagliano and P. A. Lyons (Yale University). J. Am. Chem. Soc. 78, 1549-52(1956) April.

Diffusion coefficients are presented for aqueous solutions of NaCl and $BaCl_2$ obtained at 25 ± 0.01°C using the Gouy interferometric technique. They supplement existing data, in each case confirm the electrometric results for dilute solutions, and assist in the selection of consistent self-diffusion measurements in concentrated NaCl solutions. (auth)

7487

SOLVENTS HAVING HIGH DIELECTRIC CONSTANTS. IV. CONDUCTANCES OF AMMONIUM AND SUBSTITUTED AMMONIUM HALIDES IN N-METHYLACETAMIDE AT 40° Lyle R. Dawson, Eugene D. Wilhoit, and Paul G. Sears (University of Kentucky). J. Am. Chem. Soc. 78, 1569-72 (1956) Apr. 5.

Conductances of twenty-four ammonium and substituted ammonium halides in N-methylacetamide have been measured at 40°. In the concentration range $2\text{-}80 \times 10^{-4}$N plots of Λ vs. $\sqrt{C}$ for all salts are linear with slopes from 2 to 23% greater than that predicted by the Onsager equation. Plots of Λ_0 vs. C and $S\Lambda$ vs. $C\beta^2S^2\Lambda^2$ were found to be linear also for the concentration range $2\text{-}100 \times 10^{-4}$N. The results indicate that N-methylacetamide is a leveling solvent for all types of substituted ammonium halides. For a series of salts of a given type, i.e., mono-substituted or di-substituted, the limiting equivalent conductance decreases with increasing weight of the alkyl group. For a series of halides, Λ_0 decreases as follows: $Me_2NH_2X > Me_3NHX > Me_4NX > MeNH_3X > NH_4X$. Dialkyl and tetraalkyl ammonium salts are more conducting than isomeric monoalkyl forms. The limiting equivalent conductance data afford numerous excellent confirmations of the Kohlrausch law of independent ion migration for solutions of electrolytes in N-methylacetamide. (auth)

7488

THE UPTAKE OF SODIUM AND POTASSIUM IONS BY HYDRATED HYDROXYAPATITE. William R. Stoll and William F. Neuman (University of Rochester). J. Am. Chem. Soc. 78, 1585-8(1956) Apr. 5.

Under carefully controlled conditions, hydroxyapatite was equilibrated with various mixtures of NaCl and KCl. Potassium ion was found to penetrate only the hydration shell of the crystal while Na^+, in addition, displaced Ca^{2+} from the surfaces of the crystal lattice, apparently by a mole for mole non-equivalent exchange. These two physicochemical processes may account for the amounts of K and Na observed to be present in fresh bone. (auth)

7489

VAPOR PRESSURE OF THORIA. R. J. Ackermann, R. J. Thorn, and P. W. Gillies (Argonne National Laboratory, Lemont, Ill. and University of Kansas, Lawrence). J. Am. Chem. Soc. 78, 1767(1956) Apr. 5.

The vapor pressure of ThO_2(s) at 2828°K was determined to be 1.05×10^{-4} atm. The derived vapor-pressure equation is $\log p_{(atm)} = 3.16 \times 10^4/T_{(°K)} + 7.20$. Reaction mechanisms are discussed. (C.W.H.)

7490

SELF-DIFFUSION IN MOLTEN SODIUM NITRATE. E. R. Van Artsdalen, Duane Brown, A. S. Dworkin and F. J. Miller (Oak Ridge National Laboratory, Tenn.). J. Am. Chem. Soc. 78, 1772-3(1956) Apr. 5.

The self-diffusion coefficients of Na^+ and NO_3^- in fused $NaNO_3$ were measured by a capillary method in the temperature range 315 to 375°C. Equations obtained were: $D_{Na^+} = 12.88 \times 10^{-4} \exp(-4970/RT)$ and $D_{NO_3^-} = 8.97 \times 10^{-4} \exp(-5083/RT)$ where D is in cm^2/sec. (C.W.H.)

7491

REACTION HEATS OF ORGANIC COMPOUNDS. IV. A HIGH TEMPERATURE CALORIMETER AND THE HYDROGENATION OF METHYL, ETHYL AND VINYL CHLORIDES. J. R. Lacher, E. Emery, E. Bohmfalk and J. D. Park (University of Colorado, Boulder, Colorado). J. Phys. Chem. 60, 492-5(1956) April.

The construction and operation of a high-temperature calorimeter which uses diphenyl ether as a condensing agent is described. Heats of hydrogenation of methyl, ethyl, and vinyl chloride were determined. (C.W.H.)

7492

REDUCTION WITH COMPLEX METAL HYDRIDES. Norman G. Gaylord. New York, Interscience Publishers, Inc., 1956. 1046p.

Information which was published in open literature between 1947 and 1952 on preparation and chemical reactions, especially reduction, of lithium aluminum hydride and other complex metal hydrides is reviewed. 400 references. (C.W.H.)

7493

SODIUM–ALUMINUM EQUILIBRIA IN CRYOLITE–ALUMINA MELTS. Morris Feinleib and Bernard Porter (Kaiser Aluminum and Chemical Corp., Permanente, Calif.). J. Electrochem. Soc. 103, 231-6(1956) Apr.

A qualitative and quantitative study of sodium-aluminum equilibria in cryolite-alumina melts was undertaken to shed more light on the cathode reactions in the aluminum cell. Measurements were made in alumina crucibles from 940° to 1010°C. Lead was used as an auxiliary sodium "sink." Results show that, while aluminum is more noble than sodium, their deposition potentials are not far apart (of the order of 0.1 to 0.2 v), and that, under the nonequilibrium conditions existing in an industrial cell, some sodium may be codeposited with aluminum at the cathode. (auth)

7494

MEASUREMENT OF THE ACIDITY OF AQUEOUS SOLUTIONS AT HIGH TEMPERATURES AND PRESSURES. Rathindra N. Roychoudhury and Charles F. Bonilla (Columbia Univ., New York). J. Electrochem. Soc. 103, 241-6(1956) Apr.

The potential of a platinized platinum-hydrogen electrode in two dilute hydrochloric acid solutions was measured with respect to a silver-silver chloride electrode from room temperature to 250°C at a total pressure from atmospheric to 600 psig. A fused quartz cell was employed inside a steel bomb which contained the vapor pressure of the electrolyte plus the added hydrogen pressure. The silver-silver chloride electrode was a silver plated and chloridized platinum gauze at the bottom of the cell. The hydrogen electrode was half immersed in the solution at the top. The results were reasonably reproducible and permit estimating the acidity of the solution within approximately 0.1 to 0.2 pH units. The results agree reasonably well with theoretical calculations from the Debye-Hückel theory by Lietzke. (auth)

Refer also to abstracts 7652 and 7710.

ANALYTICAL PROCEDURES

7495 AERE-C/M-1

[Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England].

THE DETERMINATION OF FLUORESCEIN (SODIUM SALT) IN SEA WATER. F. Hudswell and J. S. Nairn. [nd.] 11p.

The fluorescein content (~1 μg/l) in sea water can be determined by comparison of the ultraviolet absorption of sea-water with standard samples. (C.W.H.)

7496 CI/R-100

Gt. Brit. Ministry of Supply. Chemical Inspectrorate, London.

AN IMPROVED APPARATUS FOR DETERMINING METAL IN METAL POWDER BY THE HYDROGEN EVOLUTION METHOD. H. L. Evans and C. M. Robertson. Oct. 1955. 11p. (AD-85210).

Apparatus is described for use in the determination of metal in metal powder by the hydrogen evolution method. One form of apparatus, of which two versions are described, is adapted to give results of a high degree of accuracy, although somewhat time-consuming in operation; a second apparatus is also described which, more rapid in use, is suitable for routine inspection purposes. (auth)

7497 GAT-186

Goodyear Atomic Corp., Portsmouth, Ohio.

PURIFICATION AND DETERMINATION OF URANIUM IN IMPURE SOLUTIONS USING VERSENE. O. A. Vita, C. F. Trivisonno, and F. S. Voss. July 6, 1956. 12p. Contract AT-(33-2)-1. $0.15(OTS).

The experimental results and the results obtained from production samples indicate that the Versene method can be used to quantitatively separate and determine U from solutions containing interfering cations. Versene is used to chelate U and all interfering impurities such as Fe, Ni, Al, Zn, Cu, SiO_2, Ag, Co, sulfate, chloride, phosphate, and fluoride. The U is selectively precipitated as uranyl ammonium phosphate using ammonium dibasic phosphate. The precipitate is digested and centrifuged. The supernatant liquid is decanted and the precipitate is dissolved in concentrated HNO_3. Finally, the U content is determined colorimetrically by the basic peroxide method. (auth)

7498 HW-32436(Rev.)

Hanford Atomic Products Operation, Richland, Wash.

THE DETERMINATION OF THORIUM BY PROPORTIONAL COUNTING OF THORON. W. B. Silker. Apr. 2, 1956. 14p. Contract W-31-109-Eng-52. $0.20(OTS).

A method is described for the determination of micrograms amount of Th. This is accomplished by proportional counting of thoron, which is continuously purged from a sample in solution by a stream of A. Optimum flow rate, counter characteristics, and the proportional counter used are also discussed. (auth)

7499 NP-5906

Advance Technology Corp., White Plains, N. Y.

RADIOCHEMICAL LABORATORY MANUAL. Nov. 15, 1953. Decl. Mar. 20, 1956. 379p. For Kewaunee Mfg. Co., Adrian, Mich. Contract DA-118-108-CML-4522.

The manual which is to be used as a guide for radiochemical analyses at the Theater Chemical Laboratory contains information on basic principles of nuclear physics and radiochemistry, laboratory techniques, and selected analytical procedures. Health-physics regulations and tables of pertinent data are included. (C.W.H.)

7500 ORNL-2001

Oak Ridge National Lab., Tenn.

DETERMINATION OF ALKALI METAL AND ALKALINE-EARTH ELEMENTS BY FLAME PHOTOMETRY: A BIBLIOGRAPHY. Jeanne R. French. Oct. 31, 1955. 32p. Contract W-7405-eng-26. $0.25(OTS).

The literature, for the period 1935 through 1954, was reviewed for information pertaining to the determination of the alkali metal and alkaline-earth elements by flame photometric methods with particular emphasis on interference studies related to the determination of various combinations of these elements. Over a hundred references are given in the bibliography. (auth)

7501

FILTER SYSTEM FOR RADIOACTIVE EXHAUST FROM FLAME SPECTROPHOTOMETER. J. H. Edgerton, H. G. Davis, L. C. Henley, and M. T. Kelley, (Oak Ridge National Lab., Tenn.). Anal. Chem. 28, 557(1956) Apr.

An effective and economical filter system for removing radioactivity from exhaust gases of flame spectrophotometers is described. The system uses a special filter in an auxiliary exhaust system attached to the burner housing. (C.W.H.)

7502

QUALITATIVE DETERMINATION OF BERRYLIUM WITHOUT PRECIOUS METAL CONTAINERS. E. P. Ozhigov and T. I. Vedernikova. Zhur. Anal. Khim. 11, 111-13(1956) Feb. (In Russian)

A method of qualitative determination for beryllium is suggested in which the precious metal containers are replaced by iron beakers. The method is sufficiently sensitive and accurate. (tr-auth)

7503

THE EFFECT OF THE SOLVENT ON THE POLAROGRAPHIC REDUCTION OF CATIONS. Douglas B. Bruss and Thomas De Vries (Purdue Univ., Lafayette, Ind.). J. Am. Chem. Soc. 78, 733-6(1956) Feb. 20.

The effect of the solvent on the reduction of metal ions was investigated at a dropping mercury electrode with a silver–silver chloride electrode as reference. Nine cations were studied in water, ethylene glycol, formamide, dimethylformamide, pyridine, and the normal alcohols through pentanol and isopropyl alcohol. The half-wave potentials were found to vary in a regular manner with the dielectric constant of the solvent, usually becoming more positive as the dielectric constant decreased. A correlation was found between the shift in half-wave potential per dielectric constant unit and the quotient of the magnetic susceptibility of the ion divided by the ionic radius. The variation of the diffusion current with the square root of the fluidity of the solvent demonstrated that, for the majority of the ions, viscosity was not the only factor affecting the diffusion coefficients. (auth)

Refer also to abstracts 7507, 7599, 7604, 7606, 7737, 8055, and 8056.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

Refer also to abstract 7649.

DEUTERIUM AND DEUTERIUM COMPOUNDS

7504 A-327

Columbia Univ., New York.

CALCULATION OF THE PERFORMANCE OF EXCHANGE TOWER IN THE PRODUCTION OF HEAVY WATER. Harrison C. Carlson and J. O. Maloney. Oct. 7, 1942. Decl. May 14, 1954. 51p. Contract OEMsr-412. $9.30 (ph OTS); $3.60(mf OTS).

Procedures are outlined for the concentration of D_2O from natural water by an electrolytic-oxidation treatment. A rapid graphic method is presented for analyzing the performance of the concentrating cascades used. (C.W.H.)

7505 SRDE-1095

Gt. Brit. Signals Research and Development Establishment, Christchurch, Hants, England.

THE MEASUREMENT BY NUCLEAR RESONANCE OF LIGHT WATER CONCENTRATION IN MIXTURES OF LIGHT AND HEAVY WATER. A. M. J. Mitchell and G.

Phillips. June 20, 1955. 20p. (AD-67656).

Nuclear resonance absorption is induced in protons contained in mixtures of light and heavy water. The magnitude of the power absorption is used as a measure of the concentration of light water present and samples of known concentration are used to standardize the absorption. Two techniques for inducing the absorption are described, one appropriate for H_2O concentrations in the range 7 to 100% and the other for low concentrations. In both cases the signal output from the equipment rises almost linearly with H_2O concentration. Using the first method a signal-to-noise voltage ratio of 20 is obtained with a 7% concentration. A similar ratio is obtained from samples with 0.2% H_2O by using the second technique. The effect of flowing low concentration samples through the apparatus has been studied. The signal output falls with flow rate and at 40 ml/sec is half that obtained at zero flow. Suggestions are made for improving the stability of the equipment and for reaching a quantitative theoretical understanding of the absorption signal shapes observed. (auth)

7506 AERE-Lib/Trans-734

THE PREPARATION OF HEAVY WATER. E. W. Becker. Translated by N. Willis from Angew. Chem. 68, 6-13(1956). 18p.

Numerous ways of preparing heavy water have been suggested, but for its production on a technical scale the following methods only need be considered: electrolysis of water with chemical exchange between hydrogen and steam, distillation of water, low-temperature separation, and chemical exchange in hot-cold systems. These enrichment processes are described and compared with one another from the technical and also from the economic points of view. (auth)

7507

SEALED-TUBE COMBUSTION TECHNIQUE FOR DETERMINATION OF DEUTERIUM IN ORGANIC COMPOUNDS. Nelson R. Trenner, Byron H. Arison, and Robert W. Walker (Merck & Co., Inc., Rahway, N. J.). Anal. Chem. 28, 530-1 (1956) Apr.

A new, convenient, and precise method for the determination of deuterium in combustible substances is described. Sample size has been reduced to from 5 to 10 mg. Deuterium concentrations in the range of one at. % may be determined with a precision of ±1%. (auth)

7508

THE OXYGEN-INDUCED HYDROGEN–DEUTERIUM EXCHANGE. Ralph Klein, Milton D. Scheer, and Louis J. Schoen (Bureau of Mines, Pittsburgh). J. Am. Chem. Soc. 78, 47-9(1956) Jan. 5.

Oxygen in concentrations as low as two parts per 1000 in a hydrogen–deuterium mixture increases the rate of exchange over that of oxygen-free mixtures by a factor of 100 or more. This induced exchange results from a chain mechanism in which initiation occurs at the wall and termination in the gas phase. It is postulated that, in the presence of oxygen, OH radicals are produced at the wall, leading to a higher steady-state H-atom concentration in the gas phase than for an oxygen-free system. The terminating step is $H + O_2 + M \rightarrow HO_2 + M$ and not the atom recombination reaction operative in the uninduced exchange. (auth)

7509

VAPOR PRESSURE AND CRITICAL CONSTANTS OF D_2O. George D. Oliver and J. W. Grisard (Carbide and Carbon Chemicals Co., K-25 Plant, Oak Ridge, Tenn.). J. Am. Chem. Soc. 78, 561-3(1956) Feb. 5.

The temperature and vapor pressure relations of normal and heavy water have been determined by means of a high pressure ebulliometer. Experimental observations were summarized in table form and represented by the following equations from 208 to 300°: $\log P_{D_2O}/P_{H_2O} = 3.4273 \times 10^{-2} + 2.1988 \times 10^{-4}\, t - 2.9329 \times 10^{-7}\, t^2$; from 300 to 370.6°: $\log P_{D_2O}/P_{H_2O} = 0.21516 \times 10^{-2} - 0.22949 \times 10^{-4}\, t + 1.1143 \times 10^{-7}\, t^2$. The boiling points of the two compounds are equal at 220.7° and 340.9 psia and differ as much as 2° at the critical point of D_2O. The critical temperature of D_2O, measured by means of the quartz tube method and the vapor pressure method, was 370.9 ± 0.1°. A critical pressure of 3170 ± 5 psia for D_2O was estimated from a plot of the vapor pressure data. (auth)

7510

THE MASS SPECTRA OF FOUR DEUTERATED BUTANES. W. H. McFadden and A. L. Wahrhaftig (University of Utah). J. Am. Chem. Soc. 78, 1572-7(1956) Apr. 5.

The mass spectra of n-butane-2-d, n-butane-1,1,1-d_3, n-butane-1,1,1,3,3-d_5 and n-butane-1,1,1,2,2,3,3-d_7 using 80-volt electrons at 100° are compared with that of n-butane. The results are discussed with respect to the isotope effect, rearrangement phenomena, and activated complexes. The rate of H–D exchange in the parent molecule–ions is slower than the rate of C–C bond break, but faster than the rate of loss of H_2 or HD. Such exchange occurs between atoms on adjacent carbons and on carbons 1–3 and 1–4. (auth)

7511

PROTEIN DENATURATION IN HEAVY WATER. Robert H. Maybury (Univ. of Redlands, Calif.) and Joseph J. Katz (Argonne National Lab., Lemont, Ill.). Nature 177, 629-30 (1956) Mar. 31.

FLUORINE AND FLUORINE COMPOUNDS

7512 WADC-TR-56-4

Stanford Research Inst., Menlo Park, Calif.

THE THERMODYNAMIC PROPERTIES OF MOLTEN SALTS: MOLYBDENUM HEXAFLUORIDE. [Period Covered] June 1954 to October 1955. A. P. Brady, J. K. Clauss, and O. E. Myers. Nov. 1955. 55p. Project No. 1252. Contract AF33(616)-2558.

Assembling and testing of apparatus for measuring heat capacities from about 50°K to room temperature has been completed, including calibration of thermocouples by comparison with a Pt resistance thermometer and with a Cu one. This apparatus has been used to determine the absolute entropy of MoF_6 vapor at 298.16°K. The result, 79.7 ± 0.6 cal/mole·deg, agrees well with that calculated from its spectrum, 80.05 cal/mole·deg. A previously unreported solid-solid transition was found to occur at 263.6°K (−9.6°C). A solution calorimeter has also been assembled and tested. By comparison of the heat of solution in sodium hydroxide of MoF_6 with that of the oxide, the heat of formation of MoF_6 at 298.16°K was found to be −390.9 kcal/mole. From these values the corresponding standard free energy of formation is computed to be −363.1 kcal/mole. These data, together with data in the literature, have allowed calculation of the desired thermodynamic functions over the temperature range of interest. (auth)

7513

BROMINE PENTAFLUORIDE. THE ELECTRIC DIPOLE MOMENT IN THE VAPOR STATE AND THE DIELECTRIC CONSTANT OF THE LIQUID. Max T. Rogers, Richard D. Pruett, H. Bradford Thompson, and John L. Speirs (Michigan State Univ., East Lansing). J. Am. Chem. Soc. 78, 44-5(1956) Jan. 5.

The electric moment of BrF_5 determined from the dielectric constant of the vapor at several temperatures, is 1.51 ± 0.10 D. This value is consistent with a square prismatic structure for the molecule and excludes the trigonal bipyramidal and pentagonal planar configurations. The die-

lectric constant of the liquid in the range −12 to 25° may be represented by the equation $\epsilon = 8.20 - 0.0177\ t$. This is close to the value calculated theoretically from the gas dipole moment and indicates that BrF_5 is not an associated liquid (in the conventional sense). (auth)

7514

THE REFRACTIVE INDICES AND MOLAR REFRACTIONS OF SOME HALOGEN FLUORIDES AND FLUOROCARBON DERIVATIVES IN THE VAPOR STATE. Max T. Rogers, Jim G. Malik, and John L. Speirs (Michigan State Univ., East Lansing). J. Am. Chem. Soc. 78, 46-7(1956) Jan. 5.

The refractive indices of a series of halogen fluorides, and of several fluorocarbon derivatives, have been measured in the vapor state by an interferometric method. The molar refraction of each substance has been calculated and compared with the value obtained by addition of atomic refractions. The atomic refractions of fluorine suitable for description of the fluorocarbon derivatives (1.10) and the halogen fluorides (1.35) are larger than the normal value (0.80). This has been interpreted as indicating a greater importance of π bonds in the polyfluorides studied here than in monofluorides. (auth)

7515

FLUORINE FLUOROSULFONATE. Frank B. Dudley, George H. Cady, and David F. Eggers, Jr. (Univ. of Washington, Seattle and Univ. of New England, Armidale, Australia). J. Am. Chem. Soc. 78, 290-2(1956) Jan. 20.

The compound fluorine fluorosulfonate, SO_3F_2, has been prepared by the fluorination of sulfur trioxide in the presence of silver difluoride and excess fluorine at 220°. Its structure has been confirmed by chemical reactions and by infrared spectra. The vapor shows strong absorption at 1501, 1248, 879, 852, 789, and 575 cm^{-1}. The substance, which is a highly reactive oxidizing agent, is a gas with an odor like that of oxygen difluoride. It condenses a colorless liquid which boils at −31.3° and melts at −158.5°. (auth)

7516

NUCLEAR MAGNETIC RESONANCE SPECTRA OF FLUORINE FLUOROSULFONATE, THIONYL TETRAFLUORIDE AND PENTAFLUOROSULFUR HYPOFLUORITE. F. B. Dudley, J. N. Shoolery, and G. H. Cady (Univ. of Washington, Seattle and Varian Associates, Palo Alto, Calif.). J. Am. Chem. Soc. 78, 568(1956) Feb. 5.

7517

THE ABSORPTION SPECTRUM OF FLUORINE. Robert K. Steunenberg and Richard C. Vogel (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 78, 901-2(1956) Mar. 5.

The visible and ultraviolet absorption spectrum of F_2 was determined over the range 2100 to 8000 A. A single broad absorption peak was observed with a maximum molar absorptivity of 6.00 l/mole/cm at a wave length of 2845 A. Beer's law was obeyed over a pressure range of 50 to 760 mm. Increasing the temperature to 100° caused only a slight decrease in the absorption which was within the experimental error arising from more rapid etching of the cell windows. This absorption appears to be consistent with the pale yellow color of Fe, and it falls in place in the trend of the colors of the halogens in the periodic system. (auth)

7518

LIQUID-VAPOR EQUILIBRIA IN THE SYSTEM BROMINE–BROMINE TRIFLUORIDE. Jack Fischer, James Bingle, and Richard C. Vogel (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 78, 902-4(1956) Mar.

The 75 and 100° isotherms of the system Br_2–BrF_3 have been determined. At both temperatures the system exhibits azeotropes at pressures greater than the sum of the pressures of pure Br_2 and BrF_3. This suggests another molecular species in the vapor phase coexistent with Br_2 and BrF_3. (auth)

7519

THE IODINE PENTAFLUORIDE–HYDROGEN FLUORIDE SYSTEM. SOLID-LIQUID EQUILIBRIA VAPOR PRESSURES, MOLAR VOLUMES, AND SPECIFIC CONDUCTANCES. Max T. Rogers, John L. Speirs, Morton B. Panish and H. B. Thompson (Michigan State Univ., East Lansing). J. Am. Chem. Soc. 78, 936-8(1956) Mar. 5.

Some properties of the IF_5–HF system have been investigated. The solid-liquid phase diagram shows a eutectic point at −83.49° and 99.5 mol %. The vapor pressures at 15° show positive deviations from Raoult's law but no maximum vapor pressure was observed. There is a small decrease in volume on mixing, the maximum deviation from ideality being 6.6% at 90 mole % HF. The specific conductance of pure IF_5 at 25° is 5.4×10^{-6} ohm^{-1} $cm.^{-1}$. The specific and molar conductances of mixtures of IF_5 and HF have been measured over the entire concentration range. (auth)

7520

THE DENSITY OF LIQUID FLUORINE BETWEEN 67 AND 103°K. Roger L. Jarry and Henry C. Miller (Pennsylvania Salt Manufacturing Co., Whitemarsh Research Laboratories). J. Am. Chem. Soc. 78, 1552-3(1956) Apr. 5.

The density of liquid F_2 has been measured over the temperature range 67 to 103°K. An all metal system was used. The data obtained have been fitted to the equation, $d = 1.907 - 2.201 \times 10^{-3}T - 2.948 \times 10^{-5}T^2$, where d is the density in g/cm^3 at temperature T. The uncertainty in the density is estimated to be ±0.1%, and in temperature ±0.05°. (auth)

7521

PENTAFLUOROSULFUR HYPOFLUORITE AND THIONYL TETRAFLUORIDE. F. B. Dudley, G. H. Cady and D. F. Eggers, Jr. (University of Washington and The University of New England). J. Am. Chem. Soc. 78, 1553-7(1956) Apr. 5.

The silver difluoride "catalytic" fluorination of SOF_2 at 200° results in the formation of thionyl tetrafluoride, SOF_4, and a sulfur-hypofluorite-type molecule with the formula $SF_5{\cdot}OF$. The structure of each of these compounds has been confirmed by chemical reactions and by infrared spectra. In the vapor state, SOF_4 absorbs strongly at 1383, 928, 821, 752, 637, and 567 $cm.^{-1}$, while the pentafluorosulfur hypofluorite absorption bands occur at 935, 888, 614, and 585 $cm.^{-1}$. Both substances are gases. Thionyl tetrafluoride condenses to give a colorless liquid boiling at −49.0° and freezing at −99.6°. Pentafluorosulfur hypofluorite condenses to form a faintly yellow liquid which freezes at −86.0° and boils at −35.1°. This substance is a highly reactive oxidizing agent with an odor like that of oxygen difluoride. (auth)

7522

HIGH TEMPERATURE FLUORINATION REACTIONS OF INORGANIC SUBSTANCES WITH BROMINE TRIFLUORIDE ADDITION COMPOUNDS. Irving Sheft, Arthur F. Martin, and Joseph J. Katz (Argonne National Laboratory). J. Am. Chem. Soc. 78, 1557-9(1956) Apr. 5.

The addition compounds of BrF_3 with KF or SbF_5 are found to be excellent high temperature fluorinating agents. Dissociation pressures of $KBrF_4$ and BrF_2SbF_6 to 350° have been measured and are of such a magnitude that these reagents can be used even at 500° in closed reaction vessels without developing high pressures. Many inorganic compounds, including refractory oxides, feldspars, and oxygen-containing salts which resist fluorination by BrF_3 itself are readily converted to fluorides and elemental oxygen by $KBrF_4$ and BrF_2SbF_6 at elevated temperatures. Apparatus and techniques for carrying out these unusual high temperature fluorination reactions are described and the relative merits of these 2 reagents compared on the basis of their acid-base relationship. (auth)

7523

THE COMPOSITION OF THE LUMINOUS CENTER OF

SODIUM FLUORIDE BEADS ACTIVATED BY URANIUM. T. S. Dobrolywbskaya. (Vernadskiĭ Moscow Inst. of Geochemistry and Analytical Chemistry). Zhur. Anal. Khim. 11, 3-8(1956) Feb. (In Russian)

A number of assumptions were advanced previously stating that UF_6, $mNaF{\cdot}nUO_2F_2$, and UO_2F produces fluorescence in the melt. Investigations of luminescence spectra at the temperature of liquid oxygen and the adsorption (at a temperature of 20°C) of melt prepared in a base of NaF, LiF, and KF, and compared with the luminescence spectra of UF_6, $NaUO_2F_3{\cdot}4H_2O$, UO_2F_2, $Na_2U_2O_7$, and Na_2UO_4, have not confirmed the earlier point of view. According to the data obtained, the luminescence center is produced by a uranyl ion replacing a sodium ion in the sodium fluoride crystal lattice. (tr-auth)

7524

APPEARANCE POTENTIAL STUDY OF $CBrF_3$. A. Jacobson and J. Steigman (Polytechnic Inst. of Brooklyn). J. Chem. Phys. 24, 637-8(1956) Mar.

The appearance potentials of $CBrF_3$ fragments, at 0.5% of ion current intensities of 50-v peaks, were determined for $CBr^{81}F_3$, $CBr^{79}F_3$, and CF_3 to be 11.89, 11.97, and 12.51 ev respectively. (C.W.H.)

Refer also to abstracts 7445 and 7559.

GRAPHITE

7525

CHANGES IN PHYSICAL PROPERTIES OF GRAPHITIZED CARBON RODS UPON GASIFICATION WITH CARBON DIOXIDE. P. L. Walker, Jr. and Emile Raats (Pennsylvania State Univ., University Park). J. Phys. Chem. 60, 364-9 (1956) Mar.

Changes in the physical properties of graphitized carbon rods after gasification to different burn-offs at 1000° and to 11% burn-off at temperatures between 970 and 1372° have been determined. The physical properties investigated were surface area, total and incremental pore volume, average pore radius, macropore surface area and specific reaction rate. The results can be explained if the cargon rods are considered to be composed of relatively homogeneous, nonporous particles of petroleum coke bound together by a thin shell of coal tar pitch coke, which essentially consists of a condensed "bubble type" structure. (auth)

7526

EFFECT OF GAS DIFFUSION IN GRAPHITIZED CARBON RODS ON THEIR GASIFICATION RATE WITH CARBON DIOXIDE. P. L. Walker, Jr. and Emile Raats (Pennsylvania State Univ., University Park). J. Phys. Chem. 60, 370-2 (1956) Mar.

At high temperatures, the experimental gasification rates of graphitized carbon rods are found to deviate progressively more from their intrinsic gasification rates, as temperature is increased. This is shown to be caused by the increasing control of the reaction by the rate of transport of carbon dioxide through the internal pores of the carbon rod. The diffusional-resistance concepts used to correct the apparent activity of catalysts to their true values are found to apply equally as well for the correction of the reactivity of carbon rods with carbon dioxide. (auth)

7527

KINETICS OF THE STEAM–CARBON REACTION. Jesse S. Binford, Jr., and Henry Eyring (University of Utah, Salt Lake City, Utah). J. Phys. Chem. 60, 486-91(1956) April.

The water-gas reaction has been studied in the 900 to 1300° temperature range. A zero-order reaction with an activation energy of 60.3 kcal/mol is found in the 900 to 1100°C range, changing to a first-order process in the 1200 to 1300° range with a considerably lower value for the activation energy. Several possible mechanisms are discussed, including a surface rearrangement of adsorption sites and pre-dissociation of water vapor. A description is given of a more satisfactory type apparatus for the study of high temperature (1500°), low pressure (1 to 100 μ) heterogeneous processes in which one or more products is a gas. (auth)

LABORATORIES AND EQUIPMENT

7528

HUMIDITY AND TEMPERATURE CONTROL UNIT FOR A COUNTING ROOM. L. E. Preuss (Edsel B. Ford Inst. for Medical Research, Detroit). Nucleonics 14, No. 4, 98-103 (1956) Apr.

7529

A SAFE FOR RADIOACTIVE MATERIAL PERMITTING EASY SUPERVISION. A. Somerwil. J. belge radiol. 39, No. 1, 127-32(1956). (In English)

To allow quick, easy and accurate visual checking of a stock of Ra material a safe of relatively small dimensions was built. It offers sufficient protection and the stock is stored in such a way that visual control can be made in a few minutes without the controlling person being exposed to radiation of any importance. Construction and other details of the safe, which has no heavy mobile parts, are presented. (auth)

Refer also to abstracts 7496 and 7501.

MOLECULAR STRUCTURE

7530

MAGNITUDE OF DIFFUSIVE DISPLACEMENTS IN LIQUIDS. Richard M. Noyes (Columbia Univ., New York). J. Chem. Phys. 23, 1982(1955) Oct.

Results of recent investigations suggest that ν, frequency of diffusive displacements, and σ, root-mean-square displacement distance, in liquids can be best approximated by assuming continuous motion of the molecules with no net potential barrier to diffusive displacements. (C.W.H.)

7531

THE CATALYTIC REDUCTION OF COBALT FROM AMMONIACAL COBALT SULFATE SOLUTIONS. Thomas M. Kaneko and Milton E. Wadsworth (University of Utah, Salt Lake City, Utah). J. Phys. Chem. 60, 457-62(1956) April.

Ammoniacal cobalt sulfate solutions were reduced under hydrogen pressure in a specially designed autoclave. The rates of reduction were measured analytically by following the depletion of Co from solution. Linear reduction rates were obtained under the conditions of this study covering a temperature range of 150 to 245° and hydrogen partial pressures of 150 to 800 psi. Colloidal graphite was added in all runs and was found to act as a heterogeneous hydrogenation catalyst. Maximum rates of reduction were obtained for an ammonia to cobalt ratio of 2 to 1, indicating that the most easily reduced cobalt complex is the diammine. These results are consistent with the proposed mechanism which involves adsorption of hydrogen and cobalt ammine complex on the catalyst surface. An exponential hydrogen pressure dependency is explained in terms of structural variations associated with the quinonoid character of colloidal graphite. (auth)

7532

ENERGY LEVELS AND THERMODYNAMIC FUNCTIONS FOR MOLECULES WITH INTERNAL ROTATION. IV.

EXTENDED TABLES FOR MOLECULES WITH SMALL MOMENTS OF INERTIA. James C. M. Li and Kenneth S. Pitzer (University of California, Berkeley, California). J. Phys. Chem. 60, 466-74(1956) April.

7533

THE IONIC CHARACTER OF TRANSITION METAL HYDRIDES. G. G. Libowitz and T. R. P. Gibb, Jr. (Tufts University, Medford, Mass.). J. Phys. Chem. 60, 510-11 (1956) April.

Assuming ionic bonding in transition metal hydrides, the average value of the radius of the hydride ion, as calculated from observed inter-nuclear distances and cation radii, is 1.29 ± 0.05A. Molecular properties are briefly discussed. (C.W.H.)

RADIATION CHEMISTRY

7534 AERE-C/R-1575(1), AERE-C/R-1575(2) and AERE-C/R-1575(3)

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

SELECTED ABSTRACTS OF ATOMIC ENERGY PROJECT UNCLASSIFIED REPORT LITERATURE IN THE FIELD OF RADIATION CHEMISTRY and BIBLIOGRAPHY OF THE PUBLISHED LITERATURE. (Papers Noted up to March 1956). PART 1. THEORY, INTERPRETATIONS, WATER AND AQUEOUS INORGANIC SYSTEMS. PART 2. ORGANIC COMPOUNDS (INCLUDING POLYMERISATION REACTIONS). PART 3. GASEOUS SYSTEMS (EXCLUDING ORGANIC COMPOUNDS). R. W. Clarke, comp. (Papers Noted up to Dec. 1955 (Pt. 1). Jan. 1956. 98p.; Papers Noted up to Mar. 1956 (Pt. 2). Mar. 1956. 226p.; and (Pt. 3). Mar. 1956. 60p.).

These three parts were issued separately, but are cataloged as a unit.

7535

RADIATION CHEMISTRY FOR INDUSTRY. W. D. Conklin, A. T. Dickson, W. R. George, I. L. Green, R. M. Greenberg, E. A. Larson, A. M. Master, Jr., G. S. McLaughlin, and T. Lang Moffat. Radiation Chemistry Associates, 1955. 78p. Available from T. Lang Moffat, Apt. 207, 70 Clearview Heights, Toronto 9, Ont., Canada. $7.50.

The chemistry of several radiation-induced reactions (polymerization, sterilization, mutation, etc.) is reviewed. Present-day applications of radiation chemistry in plastics, rubber, petroleum, and other industries are outlined. The use of nuclear reactions, reactor by-products, and electrical radiation generators as commercial radiation sources was investigated. The problem areas of government regulations, safety requirements, personnel requirements, and public relations are discussed from the industrial viewpoint, and possible future industrial applications of radiation chemistry are suggested. (C.W.H.)

7536

THE γ-RAY INDUCED OXIDATION OF ASCORBIC ACID AND FERROUS ION. N. F. Barr and C. G. King (Columbia Univ., New York). J. Am. Chem. Soc. 78, 303-5(1956) Jan. 20.

The oxidation of aqueous ascorbic acid solutions by Co^{60} γ rays has been studied and interpreted in terms of the mechanism of oxidation of Fe^{2+} under similar conditions. The ratio of the rates of radiation-induced oxidation Fe^{2+} in the presence and absence of molecular oxygen was determined to be 1.89 ± 0.04. The ratio of the rates of oxidation of Fe^{2+} to the consumption of molecular oxygen was found to be 4.15 ± 0.1. The results for both substances are interpreted in terms of radical mechanisms. (auth)

7537

HOT RADICAL REACTIONS IN THE PHOTOLYSIS OF METHYL IODIDE VAPOR. Robert D. Souffie, Russell R. Williams, Jr., and William H. Hamill (Univ. of Notre Dame, Ind.). J. Am. Chem. Soc. 78, 917-20(1956) Mar. 5.

The photolysis of CH_3I vapor at 2537 A. has been investigated with particular concern for the mode of production of CH_4 and C_2H_6. It has been shown that the rate of CH_4 production is strictly linear with time, is independent of temperature, is unaffected by iodine added initially, and is decreased by addition of various unreactive gases. These facts support the view that CH_4 is exclusivly a hot radical reaction product. The rate of production of C_2H_6 is initially comparable to that for CH_4, but decreases with extent of photolysis or with initially added iodine to a limiting value 0.075 times the rate of CH_4. This limiting rate is temperature independent, and is decreased by addition of unreactive gases as with methane. It is concluded that this C_2H_6 is also the product of a hot radical reaction. Quantum yields for CH_4 and C_2H_6 have been determined as well as the efficiencies of various moderators. (auth)

7538

HOT ATOM CHEMISTRY OF CARBON; PARTICULARLY IN AROMATIC SYSTEMS. Ariel G. Schrodt and W. F. Libby (Univ. of Chicago). J. Am. Chem. Soc. 78, 1267-73(1956) Apr. 5.

The reactions of C^{14} atoms moving with the high velocities corresponding to energ es up to 40,000 ev have been studied in aniline, benzene, methanol, triphenylamine, aniline hydrofluoride, ethylamine, and methylamine hydrofluoride, all at about room temperature. The hot C^{14} atoms were generated by the reaction of thermal neutrons with nitrogen, $N^{14}(n,p)C^{14}$. For those substances, such as hydrocarbons, which do not contain N^{14} to serve as a source of C^{14} about 5 mol % of a nitrogenous material such as aniline was dissolved in the substance and the solution irradiated and studied. It was demonstrated that the nature of the carbon hot atom reactions is essentially independent of the choice of nitrogenous solute and therefore most probably is characteristic of the solvent hydrocarbon. In all cases a variety of products differing from the molecules struck by the high velocity carbon atom was produced ranging from light gases to heavy molecules with a marked tendency to yield heavy materials in the case of aromatic compounds and solid phases. It is supposed that in the case of aromatic compounds the opened ring formed by the collision of the recoiling C^{14} atom with one of the ring CH groups is so reactive that it combines not only with the C^{14} atom which struck but avidly with the surrounding molecules of the system producing a highly aromatic substituted derivative of hexane. (auth)

7539

THE PRIMARY QUANTUM YIELD OF HYDROGEN PEROXIDE DECOMPOSITION. James L. Weeks and Max S. Matheson (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 78, 1273-8(1956) Apr. 5.

In aqueous H_2O_2–HCOOH solutions a chain reaction is initiated by ionizing radiation or by 2537 A light absorbed by H_2O_2. The principal gaseous product is CO_2. This reaction is inhibited by O_2 and from the quantum yield of O_2 consumption the primary quantum yield of H_2O_2 dissociation at 2537 A is deduced to be 0.49 ± 0.065. From this yield and a comparison of the photochemical experiments with those in which the reaction is induced by γ rays, a G value of 3.06 water molecules decomposed to radicals per 100 ev of absorbed energy is calculated. A mechanism is proposed which fits the experimental data. (auth)

7540

THE PRIMARY QUANTUM YIELD IN THE PHOTOLYSIS OF HYDROGEN PEROXIDE AT 3130 A. AND THE PRIMARY RADICAL YIELD IN THE X- AND γ-RADIOLYSIS OF WATER. F. S. Dainton (Univ. of Leeds, England). J. Am. Chem. Soc. 78, 1278-9(1956) Apr. 5.

The kinetics of the polymerization of acrylamide in

deaerated aqueous solutions initiated by X- or γ-rays in the presence or absence of $Fe(ClO_4)_3$, and initiated by 3130 A light using either H_2O_2 or $FeOH^{2+}$ as photosensitizers, are outlined. It is shown that the data are consistent only if the primary quantum yield for the photolysis of H_2O_2 in aqueous solution using 3130 A light has the value 0.6 OH radical per quantum. Assuming that this quantum efficiency does not increase with increasing wave length, this result, combined with previous measurements leads to an upper limit for the primary radical yield ($G_H + G_{OH}$) in the X- or γ-radiolysis of water of 6 ± 0.4. (auth)

7541

CHEMICAL FORMS ASSUMED BY C^{14} PRODUCED BY THE REACTION $Be_3N_2(n,p)$. Peter E. Yankwich and W. R. Cornman, Jr. (Noyes Laboratory of Chemistry, University of Illinois). J. Am. Chem. Soc. 78, 1560-2(1956) Apr. 5.

Chemical fractionations have been made of the radiocarbon activities produced when pile neutron-irradiated Be_3N_2 crystals are dissolved in 2 N H_2SO_4. Methane is formed in greatest amount (26% of the total activity); other radio compounds found are guanidine (19%), carbon dioxide (14%), methylhydrazine (11%), formic acid (8%), hydrogen cyanide (7%), urea (6%), cyanamide (5%), methylamine (4%), formaldehyde (2%), and methanol and carbon monoxide (each less than 0.2%). Similar results were obtained upon solution of the target in 12 N H_2SO_4. Physical models for the slowing down of the C^{14} recoil fragment in the target matrix are compared, and result in similar chemical predictions where a simple ionic target substance is involved. (auth)

7542

RELATIVE RATE CONSTANTS FOR REACTION OF OH RADICAL WITH SULFURIC ACID, FORMIC ACID AND CEROUS ION. Thomas J. Sworski (Oak Ridge National Laboratory, Tenn.). J. Am. Chem. Soc. 78, 1768-9(1956) Apr. 5.

The decreased reactivity of H_2 with OH radical in 0.4M in H_2SO_4 was attributed to competition of H_2SO_4 with H_2 for reaction with OH radicals. ($H_2SO_4 + OH \rightarrow HSO_4 + H_2O$). (C.W.H.)

7543

A SEARCH FOR THE CHEMICAL EFFECTS OF INTERNAL CONVERSION FOLLOWING RADIATIVE NEUTRON CAPTURE. A. G. Maddock and M. M. de Maine (Univ. Chemical Lab., Cambridge, England). Can. J. Chem. 34, 441-4(1956) Apr. 5.

The possibility that neutron capture would lead to oxidation, because of internal conversion of the capture radiation, has been investigated in solid compounds of the lower valence states of Sb, As, Ce, Cr and Tl. Except in the hydrated compounds, negative results have been obtained. It is possible that oxidation is followed by electron-transfer exchange in the irradiated solids. (auth)

7544

IRRADIATION OF THIOUREA: EFFECT OF DOSE RATE UPON THE CHAIN REACTION. W. M. Dale (Christie Hospital and Holt Radium Inst., Manchester, England). Nature 177, 531(1956) Mar. 17.

7545

EFFECT OF IODINE ON THE RADIOLYSIS OF BENZENE. Robert H. Schuler (Brookhaven National Lab., Upton, N. Y.). J. Phys. Chem. 60, 381-2(1956) Mar.

The radiation yield for hydrogen production from benzene was found to be independent of iodine concentration except at very high I_2 concentrations. The mechanism of benezene radiolysis is discussed. (C.W.H.)

7546

MECHANISM IN THE RADIOLYSIS OF AQUEOUS GLYCINE SOLUTIONS. Warren M. Garrison and Boyd M. Weeks (Univ. of California, Berkeley). J. Chem. Phys. 24, 616-17 (1956) Mar.

A reaction mechanism for the radiolysis of aqueous solutions (oxygen-free) of glycine, including formation of CH_2COOH and $NH_2CHCOOH$ intermediates, is proposed. (C.W.H.)

7547

MECHANISM IN THE RADIOLYSIS OF AQUEOUS FORMIC ACID SOLUTIONS. Warren M. Garrison, Winifred Bennett, and Michael Jayko (Univ. of California, Berkeley). J. Chem. Phys. 24, 631-2(1956) Mar.

An alternate reaction mechanism is suggested for the observed radio-reduction of formic acid at concentrations above 0.05M. The mechanism includes a reduced formic acid radical $HC(OH)_2$ which could combine with COOH to form glyoxylic acid or dimerize to form glyoxal. (C.W.H.)

7548

PHOTOLYSIS OF HYDROGEN PEROXIDE IN AQUEOUS SOLUTION OF HYDRAZINE. H. A. Dewhurst and Milton Burton (Univ. of Notre Dame, Ind.). Z. physik. Chem. (Frankfurt) [N. F.] 7, 27-39(1956) Apr. (In English)

Photolysis of H_2O_2 in aqueous solutions of hydrazine sulfate (at pH = 2) by light in the region above 2200 A causes decomposition of hydrazine into N_2 and NH_3, with simultaneous production of water and oxygen. Ammonia is produced only at relatively high concentrations of hydrazine. The ratio of rate constants at room temperature for the reactions $OH + H_2O_2 \rightarrow HO_2 + H_2O$ (23) and $OH + N_2H_5^+ \rightarrow H_2O + N_2H_4^+$ (13) is now calculated from the radiolysis data to be $k_{23}/k_{13} = 1 \pm 0.1$. Atomic oxygen does not appear to be involved as an intermediate in the photolysis. (auth)

7549

INFLUENCE OF β-γ RADIATIONS FROM RADON SOURCES OF AQUEOUS SOLUTIONS OF METHIONINE. U. S. Kumta, S. U. Gurnani, and M. B. Sahasrabudhe (Indian Cancer Research Centre, Bombay). J. Sci. Ind. Research 15C, 45-7 (1956) Feb.

The results of in vitro studies on the radiosensitivity of methionine in aqueous solutions exposed to β and γ radiations are presented. The degradation of methionine follows two routes, oxidation to its sulfoxide or sulfone and gradual cleavage of C–S bonds with formation of amino acid-like substances. (auth)

7550

QUANTITATIVE ELECTRODEPOSITION OF RADIOCOBALT, ZINC, AND IRON. C. J. Maletskos and J. W. Irvine, Jr. (Massachusetts Inst. of Tech., Cambridge). Nucleonics 14, 84, 87-88, 90 & 93(1956) Apr.

The quantitative electrodeposition of Co, Zn, and Fe is discussed as a useful technique for preparing counting samples for β and x-ray assay. Procedures and electroplating tests are discussed in detail. (B.J.H.)

7551

RADIATION CHEMISTRY. F. S. Dainton (Univ. of Leeds, England). Ann. Rev. Nuclear Sci. 5, 213-40(1955).

Radiation chemistry of organic compounds and aqueous systems is reviewed. The theories of primary processes are discussed. 140 references. (C.W.H.)

7552

MASS SPECTRA AND THE CHEMICAL SPECIES PRODUCED BY THE IMPACT OF LOW ENERGY ELECTRONS. Morris Krauss, Austin L. Wahrhaftig, and Henry Eyring (Univ. of Utah, Salt Lake City). Ann. Rev. Nuclear Sci. 5, 241-68 (1955).

RADIATION EFFECTS

7553 WADC-TR-56-15

Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.

THE EFFECTS OF GAMMA RADIATION ON TEXTILE

MATERIALS. [Period covered] December 1954 to December 1955. Joyce McGrath and R. H. Johnson. Feb. 1956. 32p. Project title: AIR FORCE TEXTILE MATERIALS. Task title: TEXTILE MATERIALS FOR PARACHUTES.

Data were obtained on the effects of high-energy gamma radiation, for specific periods of time, on parachute materials. White Nylon fabrics showed the greatest loss in strength after 16 hrs exposure while Dacron fabrics retained a high percentage of strength for the same exposure. All webbings and cords had a high percentage of loss after exposure for 18.3 hrs. Resin-treated Nylon webbing gave the best results. All types of cord showed a loss in strength of 45 to 53%. (F.S.)

Refer also to abstract 8033.

RARE EARTHS AND RARE-EARTH COMPOUNDS

7554 AD-53504

Washington Univ., St. Louis.

SOME ELECTRON-TRANSFER REACTIONS INVOLVING EUROPIUM AND YTTERBIUM (thesis). Lowell Alvin King. Jan. 1955. 30p.

The reduction of Eu^{2+} by Yb^{2+} and the oxidations of Eu^{2+} by V^{3+}, Cr^{3+}, Ti^{3+}, and Ce^{4+} were investigated in 0.5F and 1F $HClO_4$ at reactant concentrations of $\sim 10^{-2}$M. These reactions were all found to be much more rapid than the $Eu^{2+}-Eu^{3+}$ exchange reaction. Some preliminary experiments were performed on the $Yb^{2+}-Yb^{3+}$ exchange reaction in 0.5F $HClO_4$ and in water at reactant concentrations of $\sim 10^{-2}$M. Evidence was found that the exchange was incomplete after ~5 seconds. (auth)

7555

THE CYCLOPENTADIENIDES OF SCANDIUM, YTTRIUM, AND SOME RARE EARTH ELEMENTS. J. M. Birmingham and G. Wilkinson (Harvard Univ., Cambridge, Mass.). J. Am. Chem. Soc. 78, 42-4(1956) Jan. 5.

Compounds of the formula $(C_5H_5)_3M$ where M is Sc, Y, La, Ce, Pr, Nd, Sm, Gd, Dy, Er, and Yb have been prepared by reaction of the metal chloride with sodium cyclopentadienide in tetrahydrofuran solution, followed by sublimation of the compounds from the dry reaction mixture at 200 to 250°C in vacuo. They are crystalline solids which react rapidly with air. The metal to C_5H_5 ring bonds are shown to be ionic in nature. Magnetic properties and absorption spectra of some of the compounds have been studied. Ammoniates of $(C_5H_5)_3Pr$ and $(C_5H_5)_3Sm$ have been noted. (auth)

7556

THE GADOLINIUM–HYDROGEN SYSTEM. Gladys E. Sturdy and Robert N. R. Mulford (Los Alamos Scientific Lab., N. Mex.). J. Am. Chem. Soc. 78, 1083-7(1956) Mar. 20.

Pressure-temperature-composition data are presented for the gadolinium–hydrogen system. Two hydride phases exist, the first being a cubic structure of ideal composition close to GdH_2, the second being a hexagonal structure of ideal composition close to GdH_3. Both hydrides exist over composition ranges. A partial phase diagram and x-ray data for the Gd–H system are presented. An enthalpy change of –46.9 kcal/mol of H_2 is obtained from the P-T-C data for the conversion of hydrogen-saturated Gd to hydrogen-deficient GdH_2 at temperatures from 600 to 800°C. (auth)

SEPARATION PROCEDURES

7557 ACCO-63

American Cyanamid Co. Atomic Energy Div. Raw Materials Development Lab., Winchester, Mass.

DEVELOPMENT OF AN ION EXCHANGE PROCESS FOR THE RECOVERY OF VANADIUM. D. C. McLean, E. T. Hollis, and R. A. Eisenhauer. July 30, 1954. 68p. Contract AT-(49-1)-533. $0.40(OTS).

A process for recovering V from acid leach liquors by ion exchange using either columns or resin-in-pulp has been developed. The process is economically feasible, and operating techniques were developed which made the process practical from an operating standpoint. The theory, chemistry, and characteristics of the V ion exchange process are fully discussed. (auth)

7558 AECD-3725

Nevada. Univ., Reno. Mackay School of Mines.

PROPOSED FLOW SHEET FOR RECOVERY OF URANIUM AND VANADIUM FROM TEMPLE MOUNTAIN ORE. H. P. Ehrlinger, III and R. W. Stephens. Dec. 1, 1953. Changed from OFFICIAL USE ONLY Dec. 28, 1955. 17p. (UN-TR-2).

7559 ANL-5593

Argonne National Lab., Lemont, Ill.

CHEMICAL AND RADIOCHEMICAL STUDIES OF TELLURIUM IN FLUORIDE VOLATILITY STUDIES. J. Fischer and R. K. Steunenberg. June 1956. 19p. Contract W-31-109-eng-38. $0.30(OTS).

Chemical and radiochemical studies were made to clarify the behavior of fission product Te in fluoride volatility processes for the recovery of U from spent reactor fuels. The chemical nature of mixtures of TeF_6 and BrF_3 was investigated in the gas phase at 75 and 100°C, and in the liquid phase at 25°C. The gas phase behavior of TeF_6 in BrF_3 was studied at 75°C, and liquid mixtures of TeF_6 and Br_2 were examined at 25°C. In none of these systems was there evidence for a chemical reaction which would produce Te compounds of low volatility. Quantitative radiochemical observations were made on the partial reduction of TeF_6 and the separation of daughter isomers due to the internal conversion of gamma rays of Te^{127m} and Te^{129m}. It was found that Te activity could be separated from BrF_3 by distillation. The activity remaining after the volatilization of a mixture of TeF_6 and UF_6 was a small fraction of the short-lived isomers Te^{127} and Te^{129}. (auth)

7560 CRCE-466

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE SEPARATION OF HAFNIUM AND ZIRCONIUM BY ION EXCHANGE. R. E. Cooper and R. M. Dinzey. Dec. 4, 1950. Decl. Dec. 1, 1955. 28p. (AECL-299). $1.00 (AECL).

Using an ion-exchange resin column, Zr containing less than 0.01% Hf, by weight, has been produced in gram quantities. The possibility of adapting the method to large scale production of Zr, substantially free from Hf, is discussed. (auth)

7561 DP-130

Du Pont de Memours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

MIXER-SETTLER DEVELOPMENT—USE OF A SHROUDED PADDLE. W. J. Mottel. Aug. 1955. 19p. Contract AT(07-2)-1.

The effects of paddle design and speed on the performance of a shrouded-paddle contactor for two liquid phases were determined. Transfer of heat between the phases was used as a measure of contacting efficiency. (auth)

7562 HW-32983

Hanford Atomic Products Operation, Richland, Wash.

A SYSTEMATIC APPROACH TO THE SOLUTION OF CHROMATOGRAPHIC PROBLEMS. J. E. Meinhard. June 2, 1954. 7p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

7563 ISC-693
Ames Lab., Ames, Iowa.
APPLICATION OF LIQUID-LIQUID EXTRACTION FOR THE SEPARATION OF ZIRCONIUM FROM HAFNIUM. R. A. Foos and H. A. Wilhelm. July 1954. 43p. Contract W-7405-eng-82. $0.30(OTS).

The use of liquid-liquid extraction for the separation of Zr from Hf was demonstrated. Hafnium spectrographically free from Zr was prepared in quantity on a continuous basis. High-purity fractions of Zr were also prepared. (auth)

7564 ISC-694
Ames Lab., Ames, Iowa.
APPLICATION OF LIQUID-LIQUID EXTRACTION TO THE SEPARATION OF TANTALUM FROM NIOBIUM. Raymond A. Foos and H. A. Wilhelm. July 1954. 76p. Contract W-7405-eng-82. $0.45(OTS).

The use of liquid-liquid extraction for the separation of Ta from Nb was demonstrated. Tantalum and Nb, spectrographically free of each other, were prepared in quantity on a continuous basis. (auth)

7565 LRL-115
California Research and Development Co. Livermore Research Lab., Livermore, Calif.
THE EXTRACTION OF ZIRCONIUM(IV) BY TRIBUTYL PHOSPHATE. E. W. Murbach and W. H. McVey. Apr. 1954. Decl. Sept. 29, 1955. 14p. Contract AT(11-1)-74.

The extraction equilibria of zirconium into TBP solution were studied by measuring the distribution of Zr^{95} tracer between 30% TBP in carbon tetrachloride and varying concentrations of nitric acid. The experimental data were best correlated by assuming that the complex $Zr(NO_3)_4(TBP)_3$ is formed in the organic phase. The equilibrium constant for the formation of the complex is 5×10^{-3}. Above two molar acid concentration, the extraction is independent of hydrogen ion. Zirconium also forms an organic soluble perchlorate–TBP complex. Above five molar perchloric acid, the perchlorate complex is more highly distributed into the organic phase than is the nitrate complex above five molar nitric acid. (auth)

7566 NP-6030
Mine Safety Appliances Co., Callery, Penna.
REMOVAL OF NaH FROM Na BY COLD TRAPPING. Memo Report No. 74. S. J. Rodgers and J. W. Mausteller. Jan. 14, 1955. 7p. Contract NObs-65426.

Sodium hydride was removed from a static sodium system by a natural circulation cold trap. The NaH content dropped from 0.200 to 0.011 wt. % NaH in 168 hr with the cold trap adjusted to 270°F at the coldest point, and the pot remaining at ~800°F (3 wt. % NaH had been added to the pot). When the trap was heated to 800°F some of the hydride was returned to the pot, the concentration rising to 0.147 in 168 hr, starting at 0.011 wt. % NaH. (auth)

7567 NYO-7487
Aeroprojects, Inc., West Chester, Penna.
INVESTIGATIONS TO DETERMINE THE FEASIBILITY OF ULTRASONIC LIQUID-LIQUID EXTRACTION. Progress Report No. 1 Covering Period from June 1 to July 31, 1955. Aug. 1955. 15p. Contract AT(30-1)-1798. $3.30 (ph OTS); $2.40(mf OTS).

A continuous ultrasonic emulsification array consisting of a stainless steel emulsification column, ultrasonic energy transmission equipment, and a twin-piston metering pump was assembled. The apparatus is suited for both co-current and countercurrent flow systems. Highly stable kerosene-in-water and toluene-in-water emulsions were made with the equipment operating in co-current flow. Preliminary experimentation in de-emulsification and an analysis of the water-nitric acid-solvent system were carried out preparatory to further work in the program. (auth)

7568 NYO-7488
Aeroprojects, Inc., West Chester, Penna.
INVESTIGATIONS TO DETERMINE THE FEASIBILITY OF ULTRASONIC LIQUID-LIQUID EXTRACTION. Progress Report No. 2 Covering Period from August 1 to September 30, 1955. 29p. Contract AT(30-1)-1798. $4.80(ph OTS); $2.70(mf OTS).

A continuous mixer-settler system has been devised to incorporate an ultrasonic treatment unit which effects complete mixing and a high degree of emulsification of a simulant system consisting of 1 N HNO_3 as the aqueous phase, and 12.5% tributyl phosphate in Amsco odorless mineral spirits as the organic phase. Following emulsification, the system separated immediately into a 1% oil-in-water emulsion and a 1% water-in-oil emulsion. Exchange efficiencies in the order of 94% ± 14% were obtained. Completely effective ultrasonic de-emulsification was obtained on a batch-treatment basis when a standing-wave system was set up in a 1% oil-in-water emulsion. Such a standing-wave equipment array can be incorporated in the mixer-settler device at each end of the system when adapted to a continuous-flow system. (auth)

7569 NYO-7489
Aeroprojects, Inc., West Chester, Penna.
INVESTIGATIONS TO DETERMINE THE FEASIBILITY OF ULTRASONIC LIQUID-LIQUID EXTRACTION. Interim Report No. 1 Covering Period from June 1 to November 30, 1955. Dec. 1955. 59p. Contract AT(30-1)-1798. $9.30(ph OTS); $3.60(mf OTS).

Preliminary experiments established the feasibility of ultrasonic liquid-liquid extraction, based on the concept of ultrasonic emulsification of the immiscible phases in a cavitation field, followed by ultrasonic emulsion breaking in a standing-wave field. Operation of continuous-flow ultrasonic emulsification equipment at a flow rate of 60 ml/min successfully dispersed immiscible phases in the aqueous nitric acid-tributyl phosphate-kerosene system and the kerosene-acetic acid-water system, producing a droplet size of the dispersed phase of less than 2μ in diameter and effecting 90 ± 10% extraction efficiency with one pass through the ultrasonic field. The emulsion spontaneously separated into dilute oil-in-water and water-in-oil emulsions. Initial studies with batch-type emulsion-breaking equipment were moderately effective in breaking the dilute oil-in-water emulsion. The results indicate the possibility of utilizing ultrasonic emulsification equipment in the development of a multistage extraction system smaller than conventional systems, with no mechanically moving parts, with only readily expendable components exposed to a radioactive field, and incorporating emulsion-breaking equipment only at each end of the contactor system. (auth)

7570 NYO-7490
Aeroprojects, Inc., West Chester, Penna.
INVESTIGATIONS TO DETERMINE THE FEASIBILITY OF ULTRASONIC LIQUID-LIQUID EXTRACTION. Progress Report No. 3 Covering Period from December 1, 1955 to January 31, 1956. Feb. 1956. 17p. Contract AT(30-1)-1798. $3.30(ph OTS); $2.40(mf OTS).

With the initiation of Phase II of the ultrasonic liquid-liquid extraction program, research effort has dealt primarily with emulsifier vessel design and fabrication as a preliminary step toward construction of a multi-stage mixer-settler. Continued search for a suitable extraction system, which will approach as closely as possible the end-use application, has resulted in the testing of the

acetic acid–water and methyl–isobutyl ketone system. Experimental work carried out at 25 kc with previously developed emulsification equipment resulted in extraction efficiencies of 91%. New treatment apparatus was designed to promote greater contact between the system phases and to insure uniform ultrasonic treatment of the entire volume of liquid utilized. This equipment was tested with various feeding configurations, and the optimum configuration with ultrasonic treatment produced extraction efficiencies significantly greater than the corresponding non-ultrasonic control system. (auth)

7571 NYO-7491

Aeroprojects Inc., West Chester, Penna.

INVESTIGATIONS TO DETERMINE THE FEASIBILITY OF ULTRASONIC LIQUID-LIQUID EXTRACTION. Progress Report No. 4 Covering Period from February 1, to March 31, 1956. Apr. 1956. 13p. Contract AT(30-1)-1798. $3.30(ph OTS); $2.40(mf OTS).

As a potentially applicable technique for the problem of transferring the heavy and light phases of a liquid-liquid system to subsequent stages in a multistage contactor design, the feasibility of utilizing the pumping action produced by ultrasonic energy was investigated. Such feasibility was established; water was raised to a height of 42 in. in a 1.5-mm bore glass column and to a height of 11 in. in a column of 4-mm bore. The approximate area of the ultrasonic coupler face and critical distance above the face at which such pumping action can be achieved were preliminarily determined. Subsequent development work with this ultrasonic pumping process will be required to achieve adequate flow rates. The effect on emulsification of phase layer thickness and relative position with regard to the ultrasonic coupler face were determined with a water and methyl-isobutyl ketone system. Good emulsification was obtained with thin water and ketone layers when a sound absorber was inserted at the liquid interface. As a result of this experimental work, a new emulsion vessel was devised for the treatment of thin phase layers; in preliminary tests, this vessel showed superior emulsification. Exploratory work previously carried out furnished much of the background data for the current design of a new emulsion-breaker vessel. This batch-type vessel incorporates a barium titanate transducer element operating in a 6-inch glass tube, which is equipped with an adjustable reflector plate. Preliminary tests at 300 kc and 800 kc were successful, and the wave pattern could be controlled by means of the adjustable reflector plate. (auth)

7572 ORNL-1738

Oak Ridge National Lab., Tenn.

URANIUM HEXAFLUORIDE DISTILLATION: CORRELATIONS FOR ENGINEERING DESIGN. J. T. Long. Aug. 26, 1954. Decl. May 31, 1956. 58p. Contract W-7405-eng-26. $9.30(ph OTS); $3.60(mf OTS).

With the reservations and modifications enumerated, methods of calculation now in the literature may be safely applied in the design of equipment for the fractionation of mixtures of UF_6 and other dense substances. Equipment characteristics treated are flooding, pressure drop, hold-up, and stage efficiency. A design manual for UF_6 fractionating columns is presented, and sample calculations are shown. (auth)

7573 ORNL-1964

Oak Ridge National Lab., Tenn.

SOLVENT EXTRACTION OF URANIUM (AND VANADIUM) FROM ACID LIQUORS WITH TRIALKYLPHOSPHINE OXIDES. C. A. Blake, K. B. Brown, and C. F. Coleman. Aug. 26, 1955. 111p. Contract W-7405-eng-26. $0.60 (OTS).

A number of symmetrical phosphine oxides were prepared and examined systematically for their ability to extract U from acidic nitrate, chloride, sulfate, and phosphate solutions, and mixtures thereof. Most of the compounds tested showed high affinity for U, excellent extractions being obtained from nitrate and chloride solutions, and under the proper conditions from sulfate solutions, including a wide variety of solutions in which the structurally similar trialkylphosphates are ineffective. Extractions from sulfate or phosphate solutions were remarkably increased by the addition of very small amounts of nitrate and to a lesser degree by the addition of chloride. Uranium was effectively stripped from the organic solution with Na_2CO_3. Brief tests with process-type liquors showed useful and selective U extraction from HNO_3 leach liquors of Florida Leached Zone ore, from chloride-sulfate and "green-sludge" liquors as produced in a salt-roast, acid-leach process for Western ores, and, when the reagent concentration was sufficiently high, from sulfate liquors as produced in direct treatment of Western ores. (auth)

7574 ORNL-2058

Oak Ridge National Lab., Tenn.

DECONTAMINATION OF THE ORNL THOREX PILOT PLANT. K. H. McCorkle and W. R. Winsbro. July 25, 1956. 31p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Decontamination of the Thorex Pilot Plant is described. Twenty-four major pieces of highly contaminated stainless-steel processing equipment were decontaminated in 19 days to safe working levels by alternate treatments with 20% sodium hydroxide—2% sodium tartrate and 20% nitric acid. Oxalic acid or citric acid was substituted for tartaric acid in about half the treatments. The average cost per treatment was $222; the total cost was $36,000. (auth)

7575 USNRDL-TR-88

Naval Radiological Defense Lab., San Francisco.

CHROMATOGRAPHY OF DEOXYRIBONUCLEIC ACIDS ON CALCIUM PHOSPHATE COLUMNS. R. K. Main and L. J. Cole. May 22, 1956. 21p. Project NM 006-015.04.

Calcium phosphate columns in conjunction with linear gradient elution with phosphate solution increasing in concentration from 0.005 M to 0.4 M at pH 6.7 have been applied to the chromatographic separation of high-polymeric calf thymus deoxyribonucleic acid (DNA) from the products obtained by short term (30 min) digestion of DNA with deoxyribonuclease (DNAse). It was found that DNA alone, initially adsorbed on such columns, was not eluted until the phosphate concentration of the eluting solution approached 0.15 M. Up to 72 per cent of the total DNA was eluted in the range between 0.15 M and 0.25 M phosphate. No additional elution peaks occurred at concentrations between 0.25 M and 0.40 M phosphate. Chromatographic analyses of mixtures of untreated DNA with DNA-digests revealed at least three major fractions. The first fraction was not adsorbed by the column and came through immediately in 0.005 M phosphate solution. A second peak appeared at 0.045 M phosphate; a third elution maximum occurred at 0.2 M phosphate. This latter peak corresponded with that obtained with untreated DNA, when chromatographed alone. The present results indicate that high molecular weight deoxypolynucleotides can be separated from undegraded DNA under mild conditions of pH and ionic strength, by calcium phosphate column chromatography. (auth)

7576 AEC-tr-2511

MAKING A TRANSPARENT DRY FILM FROM PAPER-CHROMATOGRAMS AND PAPERELECTROPHEROGRAMS. Jean Barrollier. Translated from Naturwissenschaften 42, 126(1955). 3p.

7577

HYDROLYTIC BEHAVIOR OF METAL IONS. V. ULTRACENTRIFUGATION OF HAFNIUM(IV). James S. Johnson, Kurt A. Kraus, and Robert W. Holmberg (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 78, 26-33(1956) Jan. 5.

By equilibrium ultracentrifugation Hf_{4+} was found to form a low molecular weight hydrolytic polymer (or polymers) in ca. one molar acid solutions with an approximate degree of polymerization N of 3 or 4 (trimer or tetramer). Studies were carried out as a function of initial Hf^{4+} concentration (0.008 to 0.1M), of supporting electrolyte concentration (1 to 2M), of type of supporting electrolyte (HCl, and HCl with LiCl, NaCl, and CsCl), of acidity (0.5 to 2M H_3O^+) and of temperature (~1 to 30°). By combination of these experiments simultaneous evaluation of N and of the charge z of the polymeric ion was attempted. (auth)

7578

COMPLEX COMPOUNDS OF ZIRCONIUM(IV) AND HAFNIUM(IV) WITH ETHYLENEDIAMINETETRAACETIC ACID. L. O. Morgan and Norman L. Justus (Univ. of Texas, Austin). J. Am. Chem. Soc. 78, 38-41(1956) Jan. 5.

Zirconium(IV) and hafnium(IV) perchlorate solutions were stabilized toward precipitation with NaOH by reaction with salts of ethylenediaminetetraacetic acid. Reaction probably proceeded through addition of reagent to hydrolytic polymers of sufficient complexity that essential equivalence of individual units could be assumed. In competitive reaction experiments the stability constant of the 1:1 zirconium(IV) complex was found to be 12.5 times that of the copper(II) chelate at 25°C. On the basis of relative ease of hydrolysis, the stability constant of the hafnium(IV) complex was estimated to be approximately one-half that of the zirconium compound. The zirconium(IV) complex compound isolated from aqueous solution at pH 6 was found to contain 1.1 ethylenediaminetetraacetate groups per Zr atom. The precipitate obtained at both extremes of the pH range of stability was found to be essentially by hydrous zirconium oxide. The over-all behavior of Hf^{4+} was sufficiently similar that isolation and identification of hafnium(IV) compounds was not considered to be necessary. (auth)

7579

ANION EXCHANGE STUDIES. XIX. ANION EXCHANGE PROPERTIES OF HYDROUS ZIRCONIUM OXIDE. Kurt A. Kraus and Harold O. Phillips (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 78, 249(1956) Jan. 5.

7580

RATE OF FERROUS-FERRIC EXCHANGE IN D_2O. J. Hudis and R. W. Dodson (Brookhaven National Lab., Upton, N. Y.). J. Am. Chem. Soc. 78, 911-13(1956) Mar. 5.

The rate of the $Fe^{2+}-Fe^{3+}$ electron exchange reaction has been measured in D_2O as a function of $HClO_4$ concentration at constant ionic strength. As in H_2O, the acid dependence indicates two reaction paths involving Fe^{3+} and hydrolyzed Fe^{3+}, respectively. The specific rate constants are each lowered by a factor of ~2 in D_2O. The result supports the idea of a hydrogen "atom transfer" mechanism for electron exchange. (auth)

7581

ISOTOPIC EXCHANGE IN NON-STABLE SYSTEMS. C. P. Luehr, G. E. Challenger, and B. J. Masters (Los Alamos Scientific Lab., N. Mex.). J. Am. Chem. Soc. 78, 1314-17 (1956) Apr. 5.

A general expression has been derived to represent the progress of a simple exchange reaction in a homogeneous system of non-constant volume undergoing simultaneous chemical conversion of either exchanging species into the other. The method has been applied to a number of specific examples and quantitative results have been obtained. (auth)

7582

THE KINETICS OF THE EXCHANGE OF ANTIMONY BETWEEN ANTIMONY TRICHLORIDE AND ANTIMONY PENTACHLORIDE IN CARBON TETRACHLORIDE. Franklin B. Barker and Milton Kahn (Univ. of New Mexico, Albuquerque). J. Am. Chem. Soc. 78, 1317-19(1956) Apr. 5.

A measurable exchange has been observed between $SbCl_3$ and $SbCl_5$ in CCl_4. The exchange reaction was investigated over a temperature range from 50.1 to 81.0°; the concentration of $SbCl_3$ ranged from 0.0153 to 0.115M and that of $SbCl_5$ from 0.0055 to 0.0667M. The rate law for the exchange reaction is $R = 1 \times 10^6 \exp^{-15,000/RT} (SbCl_5) + 4 \times 10^6 \exp^{-13,000/RT} (SbCl_3)(SbCl_5)^2$ where the units of R are mol/l/sec. (auth)

7583

SOLVENT EXTRACTION OF ZIRCONIUM WITH TRIBUTYL PHOSPHATE. Arnold E. Levitt and Harry Freund. Cornwallis. (University of Massachusetts, Amherst, and Oregon State College). J. Am. Chem. Soc. 78, 1545-9(1956) Apr. 5.

A study of the effect of certain variables on the extraction of Zr from HCl solutions by tributyl phosphate (TBP) has been made. The variation in the Zr distribution ratio D with TBP concentration in TBP–benzene solutions gives evidence of a 2:1 molar ratio of TBP to Zr in the species extracted. Studies were made of the Cl:Zr molar ratio in the organic phase. An investigation of the variation of D with aqueous chloride concentration at constant acidity and constant ionic strength was made. The effect of aqueous acidity on D at constant chloride concentration and constant ionic strength was also investigated. The results of these studies offer evidence for $ZrCl_4(TBP)_2$ as the species present in the organic phase. A decrease in D with increasing initial zirconium concentration at constant aqueous HCl concentration and constant organic TBP concentration indicates greater extent of Zr polymerization in the aqueous phase than in the organic phase. (auth)

7584

PREDICTION OF IDEAL-STAGE REQUIREMENTS IN COMPLEX LIQUID-LIQUID EXTRACTION SYSTEMS. H. C. Peterson and G. H. Beyer (Iowa State Coll., Ames). A. I. Ch. E. Journal 2, 38-41(1956) Mar.

A procedure for obtaining equilibrium data and predicting ideal-stage requirements in a complex liquid-liquid extraction system is presented. Preliminary equilibrium data are obtained from a simulated column run involving a series of batch contacts operated in such a manner as to approach steady state countercurrent conditions. The flow ratios and stage requirements for continuous operation are then estimated by trial-and-error by use of a modified McCabe-Thiele method. The procedure lends itself particularly well to those systems with interdependent distribution of the two components. Data for the separation of Hf from Zr are presented to show the utility of the method. (auth)

7585

INEXPENSIVE SLURRY COOLER PERMITS HIGHER RECOVERY FROM COLORADO PLATEAU URANIUM ORES. James D. Moore. Ind. Eng. Chem. 48, 111A-12A(1956) Apr.

An inexpensive slurry cooler for higher recovery of U from the Colorado Plateau uranium ores is described. (auth)

7586

BENZOATE METHOD OF ALUMINUM DETERMINATION. A. I. Ponomarev and A. Ya. Sheskol'skaya (Baĭkov Moscow Inst. of Metallurgy). Zhur. Anal. Khim. 11, 102-5(1956) Feb. (In Russian)

A newly developed weighing method for the determination of aluminum in iron ores and industrial products has indicated that the quickest and most reliable precipitation of aluminum is effected by ammonium benzoate in a medium

of weak acetic acid. The iron reduced by sodium hydrosulfite to a bivalent state does not interfere with the determination of Al. The method permits a quick qualitative determination of aluminum in the presence of a high content of iron. (tr-auth)

7587

THE SEPARATION OF PROTACTINIUM AND ZIRCONIUM BY AN ANION EXCHANGE COLUMN. A. G. Maddock and W. Pugh (The Univ. Chemical Labs., Cambridge, England). J. Inorg. and Nuclear Chem. 2, 114-17(1956) Feb.

Conditions for the separation of Zr and Pa by anionic exchange on an Amberlite IRA-400 resin column are described. The separation has been tested at mascroscopic concentrations of the elements. (auth)

7588

CONCENTRATION EFFECTS ON SOLVENT EXTRACTION COEFFICIENTS OF SOME TRIVALENT METAL HALIDES. Jerome Saldick (Brookhaven National Laboratory, Upton, N. Y.). J. Phys. Chem. 60, 500-1(1956) April.

The effects of an extractable acid on the solvent extraction of trivalent metal halides in strong acid solutions by an organic solvent are discussed. The derived relationships indicate that the extraction coefficient $E_{org/aq}$ is a function of the acidity in the organic phase. (C.W.H.)

7589

RADIOCHEMICAL SEPARATION TECHNIQUES. H. L. Finston and John Miskel (Brookhaven National Lab., Upton, N. Y.) Ann. Rev. Nuclear Sci. 5, 269-96(1955).

The following techniques for the separation of radioisotopes are reviewed: precipitation, solvent extraction, volatilization, and chromatography. The application of various instruments (γ spectrometers and α pulse-height analyzers) to isotope identification is also discussed. 104 references. (C.W.H.)

7590

CHEMICAL PROCESSING IN THE NUCLEAR POWER INDUSTRY. III. AQUEOUS PROCESSES. F. S. Martin and G. L. Miles (Atomic Energy Research Establishment, Harwell, Berks, England). Atomics 7, 79-87 & 110(1956) Mar.

A number of different types of aqueous processes for irradiated nuclear reactor fuels are discussed. Fuel dissolution, precipitation, extraction, and ion exchange separations are described, together with some aspects of the basic chemistry of solvent processes. (auth)

7591

LIQUID-LIQUID EXTRACTION PROCEDURES IN INORGANIC ANALYSIS. T. S. West (Department of Chemistry, University of Birmingham). Metallurgia 53, 132-4(1956) March.

Liquid-liquid extraction techniques in inorganic analysis, with particular reference to metallurgical analysis, are surveyed. The first article in this series appeared in Metallurgia 53, 96(1956). (F.S.)

Refer also to abstracts 7607 and 7739.

SORPTION PHENOMENA

7592 AERE-Lib/Trans-736

PASSAGE OF HYDROGEN THROUGH METALS. G. Borelius and S. Lindblom. Translated by B. N. Clack from Ann. Physik 82, 201-26(1927). 20p.

The passage of hydrogen through the walls of iron, nickel, Monel and palladium–platinum alloy tubes has been investigated at various pressures below atmospheric and at various temperatures up to 700°. With iron the passage under high pressures was followed down to room temperature. With iron also the passage of electrolytically separated hydrogen was measured at various current densities and at temperatures between room temperature and 100°C. Results showed that at not too high temperatures the adsorption from the gas is largely one of hydrogen molecules which dissociate on the surface or in the metal; that in electrolysis the adsorption occurs as soon as the hydrogen is formed and that in both cases the escape of hydrogen from the metal is proceeded by the formation of a molecule. (auth)

7593

ANION-EXCHANGE STUDIES. III. Ni(II) IN AQUEOUS HYDROCHLORIC ACID AND LITHIUM CHLORIDE. Rolfe H. Herber and John W. Irvine, Jr. (Massachusetts Inst. of Tech., Cambridge). J. Am. Chem. Soc. 78, 905-7(1956) Mar. 5.

Ion-exchange studies on the system Ni(II)–HCl–Dowex-1 indicate the absence of anionic species $NiCl_3^-$, $NiCl_4^{2-}$, etc., in the resin phase, and theory suggests the concomitant absence of these species in the aqueous phase. Optical measurements on aqueous solutions of $NiCl_2$ in HCl, $HClO_4$, and LiCl indicate the presence of only Ni^{2+} and $NiCl^+$ up to chloride ion concentrations of ~11M, with no evidence being observed for the presence of $NiCl_2$ in these solutions. (auth)

7594

INFLUENCE OF ELECTROLYTE UPTAKE ON THE EQUILIBRIUM CONSTANT FOR THE SODIUM–HYDROGEN EXCHANGE ON DOWEX 50. Elizabeth W. Baumann and William J. Argersinger, Jr. (Univ. of Kansas, Lawrence). J. Am. Chem. Soc. 78, 1130-4(1956) Mar. 20.

The influence of the inclusion of electrolyte uptake on the calculated thermodynamic equilibrium constant for the Na–H_2 exchange on Dowex 50 has been investigated. It was found that the contribution of the electrolyte uptake term is significant in the determination of the activity coefficient, f, for each pure resin in a solution of the corresponding salt at molality m. In the case studied, however, if these coefficients are included in the calculation, log K is not appreciably affected by neglect of the electrolyte uptake in the exchange itself. For the Na–H_2 exchange an adequate approximation to these log f terms is given by the negative of the product of the water uptake (the number of moles of water per equivalent of resin) and the logarithm of the activity of water in the binary solution. (auth)

7595

ENTROPY OF KRYPTON ADSORBED ON TITANIUM DIOXIDE (ANATASE). E. L. Pace, W. T. Berg and A. R. Siebert (Morley Chemical Laboratory, Western Reserve University). J. Am. Chem. Soc. 78, 1531-3(1956) Apr. 5.

Calorimetric measurements of the heat capacity, adsorption isotherms, and heat of adsorption between 12 and 140°K have been used to determine the zero point entropy of Kr adsorbed on TiO_2 of the anatase form. The zero point entropy of 0.00765, 0.01396, and 0.02421 mole of adsorbed gas corresponding to the monolayer fractions 0.13, 0.23, and 0.40 are, respectively, 1.1 ± 1.1, 1.5 ± 0.6, and 1.3 ± 0.3 cal/deg/mol. The results indicate strongly that thermodynamic equilibrium has not been attained between the surface and the adsorbed gas. The experimental procedure which was used as well as theoretical consideration leads one to believe that most of the randomness in the system existing at approximately 50°K. was preserved at temperatures below this value. (auth)

7596

ON THEORETICAL ANALYSIS OF DIFFUSION PROCESSES. V. V. Kafarov. Zhur. Priklad. Khim. 29, 40-6 (1956) Jan. (In Russian)

Principles of diffusion processes and their intensification are analyzed. Corrections of the film absorption theory and diffusion in a turbulent boundary are discussed. (R.V.J.)

7597
ON ACID-BASES MECHANISM OF ABSORPTION ON SILICA GEL. A. V. Kisilev (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 106, 1046-9(1956) Feb. 21. (In Russian)

Refer also to abstract 7824.

SPECTROSCOPY

7598 MCC-1023-TR-165
Olin Mathieson Chemical Corp., Baltimore.
MASS SPECTRA OF THE BORANES. B. Keilin. Aug. 9, 1955. 12p. Contract NOa(s)52-1023-c.

The mass spectra of all known volatile boranes have been reviewed and compared; these include diborane, tetraborane, pentaborane(9), pentaborane(11), hexaborane, octaborane, nonaborane and decaborane. In addition, clear evidence for the existence of a heptaborane has been found. For analytical purposes, the characteristic half-peaks shown by each of these compounds offers a quick, reliable method of detection. The mass spectra of the boranes have been confirmed in several cases by the use of samples prepared from isotopically enriched boron. Monoisotopic mass spectra of the boranes have been used to gain information concerning their chemical reactivity and structure. (auth)

7599
A NEW METHOD FOR DETERMINATION OF THE CHEMICAL COMPOSITION IN ALLOYS. I. B. Borovskiĭ and N. P. Ilin (Baĭkov Inst. of Metallurgy). Doklady Akad. Nauk S.S.S.R. 106, 655-7(1956) Feb. 1. (In Russian)

A new method and special apparatus were developed for determination of the chemical composition in the microvolume (~10 μ^3) of alloys using the characteristic radiation excited by focused electron beams. The method enables one to determine various elements in a given point of the microsection and the distribution of certain elements in various areas of it, with the sensitivity up to 0.1%. Experiments made with a series of complex metal alloys, cermets, welded seams, and diffusion layers to determine the distribution of Fe, Ni, Cu, Zn, Nb, Mo, W, and Re elements in microvolumes and in the given directions, established the practicability of the offered method. (R.V.J.)

Refer also to abstract 7523.

TRACER APPLICATIONS

7600 AERE-Lib/Trans-690
PROBLEMS AND METHOD OF TRACE ENRICHMENT. H. Specker and H. Hartkamp. Translated by R. J. Richardson from Angew. Chem. 67, 173-8(1955). 15p.

TRANSURANIC ELEMENTS AND COMPOUNDS

7601
ISOTOPIC EXCHANGE REACTIONS OF NEPTUNIUM IONS IN SOLUTION. IV. THE EFFECT OF VARIATION OF DIELECTRIC CONSTANT ON THE RATE OF THE Np(V)-Np(VI) EXCHANGE. Donald Cohen, J. C. Sullivan, E. S. Amis, and J. C. Hindman (Argonne National Laboratory). J. Am. Chem. Soc. 78, 1543-5(1956) April.

The isotopic exchange reaction between Np^{5+} and Np^{6+} has been studied at 0°C, in a medium of aqueous $HClO_4$ containing varying weight percentages of ethylene glycol or sucrose. The data show that the reaction rate for the isotopic exchange is negligibly affected by the variation of the macroscopic dielectric constant in these solvents. This result is discussed in terms of the current theories of the mechanism of electron exchange reactions. (auth)

URANIUM AND URANIUM COMPOUNDS

7602 ORNL-2092
Oak Ridge National Lab., Tenn.
X-RAY DIFFRACTION DATA FOR SOME URANIUM COMPOUNDS. H. W. Dunn. Aug. 2, 1956. 48p. Contract W-7405-eng-26. $0.35(OTS).

X-ray-diffraction data have been accumulated for a large number of U compounds. These data are given for pure compounds and other compounds. (W.L.H.)

7603 ORNL-2112
Oak Ridge National Lab., Tenn.
RAW MATERIALS PROCESS TESTING. Engineering Section Progress Report [for] July–December 1955. K. O. Johnsson, ed. July 25, 1956. 39p. Contract W-7405-eng-26. $0.30(OTS).

Engineering studies on extraction processes for recovery of U from sulfate leach liquors were continued. Leaching and clarification equipment have been installed so that the extraction processes can be tested with actual leach liquors. Several tons each of 6 different Colorado Plateau ores have been ground and blended to provide a supply of feed material for testing. Leaching tests have been made on samples of ground ore to determine acid requirements for uranium leaching and composition of leach liquor. The Amex Process testing work consisted of studying the chemical behavior in a countercurrent system using several types of clear leach liquors. An investigation has been started to evaluate the variables affecting the extraction efficiency of mixer-settler equipment to obtain design data. In the slurry extraction program, the extraction efficiency and organic entrainment were studied in a single mixer-settler unit. (auth)

7604
CONSIDERATIONS ON THE ANALYTICAL CONTROL OF SULFUR TRACES IN URANIUM METAL. R. Fernández Cellini and L. Gascó Sanchez. Anales real soc. espan. fis. y quim. (Madrid), Ser. B. 52, 111-16(1956) Feb. (In Spanish)

Volumetric and colorimetric determinations of sulfur in U have been carried out by acid treatment and evaluation of SH_2. A discussion of both methods is presented. (auth)

7605
PHYSICAL PROPERTIES OF AQUEOUS URANYL SULFATE SOLUTIONS FROM 20 TO 90°. Edward Orban, Martin K. Barnett, Jane S. Boyle, John R. Heiks and Lerroy V. Jones (Monsanto Chemical Company, Miamisburg, Ohio). J. Phys. Chem. 60, 413-15(1956) April.

Measurements of the density, surface tension, viscosity, and pH of aqueous solutions of UO_2SO_4 up to as high as 4 molal in concentration and in a temperature range between 20 and 90°C are reported. (auth)

7606
THERMOGRAVIMETRIC PYROLYSIS OF 8-QUINOLINOL AND 5,7-DIHALO-8-QUINOLINOL CHELATES OF SCANDIUM, THORIUM, AND URANIUM(VI). Wesley W. Wendlandt (Texas Technological Coll., Lubbock). Anal. Chem. 28, 499-501(1956) Apr.

The thermogravimetric pyrolysis of the 8-quinolinol, 5,7-dichloro-8-quinolinol, and 5,7-dibromo-8-quinolinol chelates of Sc, Th, and U^{4+} was determined. It was found that only two of the chelates can lose the extra molecule of solvation by thermal decomposition—namely, the 8-quinolinol chelates of Th and U^{4+}. Oxide levels of the ignited

chelates were found in the temperature range from 450 to 600°C. The sublimation curves for the three chelating agents were also investigated. (auth)

7607

THE VOLATILIZATION OF PLUTONIUM FROM NEUTRON-IRRADIATED URANIUM. D. E. McKenzie (Atomic Energy of Canada Ltd., Chalk River, Ont.). Can. J. Chem. 34, 515-22(1956) Apr.

The volatilization of Pu from neutron-irradiated U has been examined at 1540, 1650, and 1769°C. The observed rates of evaporation of Pu have been compared with calculated rates based on the Langmuir equation and Raoult's law. Experimental and calculated results agree within the precision of the experimental measurements, indicating that the Pu in neutron-irradiated U follows the ideal solution laws. (auth)

Refer also to abstract 7497.

WASTE DISPOSAL

7608 GAT-184

Goodyear Atomic Corp., Portsmouth, Ohio.

A STUDY OF THE FLUORIDE CONCENTRATION IN THE SCIOTO RIVER AND TRIBUTARY STREAMS. H. L. Burkhardt, H. L. Caterson, B. Kalmon, and R. A. Manning. May 29, 1956. 14p. Contract AT-(33-2)-1. $0.20(OTS).

The gaseous diffusion plant diverts approximately one-third of the Scioto River flow through the plant. The plant effluent is discharged into tributaries of the Scioto and is returned to the Scioto. A small amount of fluorides are added to the content of the water by plant operations. The average net amount of fluorides in the Scioto River below the point at which the plant effluent is returned to the river is less than the average fluoride content of the Scioto River at the plant intake point. The monthly results as cumulative mean values for the fluoride content of the Scioto River above and below plant site are demonstrated. The net reduction of fluorides is believed to result from both a secondary chemical reaction taking place in the plant water system, and from the dilution factor of the tributary streams entering the Scioto River in the area surrounding the plant site. Using the most extreme conditions of fluoride contamination experienced, and making the broadest assumptions regarding the possible amount of fluorides added by plant operations, the net effect on the fluoride content of the Scioto River was calculated to be insignificant when compared with the average fluoride content of the Scioto River. (auth)

7609 GAT-185

Goodyear Atomic Corp., Portsmouth, Ohio.

DISPERSAL PATTERNS AND EFFECTS OF FLUORINE VENT GASES. H. L. Burkhardt, H. L. Caterson, R. A. Manning, and B. Kalmon. June 29, 1956. 11p. Contract AT-(33-2)-1. $0.15(OTS).

The Goodyear Atomic Corporation program to follow the offsite movement of fluorine compound waste gases, which are vented directly to the atmosphere in the course of production operations, is presented. The program includes routine monthly vegetation, air, water, and mud sampling, aerial and ground photographic studies in color, and compilation of meteorological data. Results indicate no appreciable fluorine uptake in surrounding water, soil, or vegetation. It is concluded that dispersal of fluorine vent gases is in accordance with an inverse square law. This fact makes it improbable that damaging concentrations could move from the plant site without leaving widespread evidence of damage to onsite foliage, or without causing immediate complaints from GAT personnel of oppressive fluorine odor. (auth)

7610 KAPL-610

Knolls Atomic Power Lab., Schenectady, N. Y.

A REPORT ON THE DEVELOPMENT AND OPERATION OF A PILOT INCINERATOR FOR CONTAMINATED COMBUSTIBLE SOLID WASTES. F. N. Schell. Oct. 1, 1951. Changed from OFFICIAL USE ONLY June 26, 1956. 65p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

An incinerator for burning contaminated waste products is described. The equipment includes a furnace, a settling chamber, a Pease-Anthony scrubber, a water-sealed bypass around the scrubber, a rough glass wool filter, two CWS filters in parallel, and a blower. The capacity of the incinerator is approximately 40 lbs/hr. It was found that best results were obtained when the charges were baled and weighed less than 60 lbs. Data on performance and schematic sketches of the equipment are included. (C.H.)

7611

GROUND DISPOSAL OF RADIOACTIVE WASTES. Roy J. Morton and Edward G. Struxness. Am. J. Public Health 46, 156-63(1956) Feb.

ENGINEERING

7612 AD-40826

Massachusetts Inst. of Tech., Cambridge.

INVESTIGATION OF STRENGTH AND BUCKLING CHARACTERISTICS OF TRANSVERSE BULKHEADS IN CYLINDRICAL SHELLS. A Bibliography. Warren B. Delano, comp. Mar. 15, 1954. 13p. Project No. TUI-2030. Contract DA-19-020-ORD-2800.

7613 K-1293

Oak Ridge Gaseous Diffusion Plant, Tenn.

NATURAL FREQUENCIES OF UNIFORM CONTINUOUS BEAMS. D. W. Burton. July 24, 1956. 17p. Contract W-7405-eng-26. $0.20(OTS).

A method of calculating the natural frequencies of uniform continuous beams is presented. The advantage of this method lies in that the characteristic equations can be written down for any number of spans. This eliminates the problem of solving a large order determinant. The characteristic equations are of simple transcendental forms which can be solved readily by an iteration scheme. A simple graph includes the natural frequencies for any number of spans. (auth)

7614 NACA-TM-1392

ON THE BUCKLING OF BARS AND PLATES IN THE PLASTIC RANGE. PART II. (Over het knikvraagstuk in het plastische gebied bij staven en platen. Decl. II.) J. P. Benthem. Translated from Nationaal Luchtvaartlaboratorium, Amsterdam, Rapport S. 423, Jan. 1954. 79p.

A review is made of existing literature concerning comparison with experiment of various theoretical formulas for buckling of plates in the plastic region. The significance and relative merits of various theories are discussed. (auth)

7615 NP-5909

Continental Oil Co., Ponca City, Okla.

DEVELOPMENT AND EVALUATION OF A GREASE FOR −100° TO +350°F. Quarterly Report No. 1 for Period December 15, 1955−March 15, 1956. E. W. Nelson, W. W. Woods, and W. P. Scott. Mar. 15, 1956. 15p. Contract AF 33(616)-2364, Supplemental Agreement No. 3(56-820).

The development of a grease with a high-load carrying capacity that is operational over a −100° to 350°F. temperature range is reported. It was proposed that such a

grease would be made by forming a fluid dispersion of colloidal calcium carbonate in a suitable base oil followed by chemical interlinking of the dispersed particles to form the grease structure. (auth)

7616 IGRL-T/R-6

THE DESIGN OF AN ELECTROMAGNETIC BRAKE. M. A. Panasenkov. Translated by E. Bevitt from Elektrichestvo, No. 12, 13-18(1954). 11p.

A method is given for the calculation of electromagnetic brakes. The dependence of the moment and flux on the speed of rotation is given, including effects of armature reaction, variation of rotor temperature and cross distribution of magnetizing force. The concept of the coefficient of demagnetization is introduced and the connection between this coefficient and the coefficients of electrical resistance is given. The dependence of the tangent and cosine of the angle between current and emf with speed of rotation is given. (auth)

Refer also to abstract 7584.

HEAT TRANSFER AND FLUID FLOW

7617 ACA-55

Australia. Aeronautical Research Committee, Melbourne.

TURBULENT BOUNDARY LAYER CONTROL BY RAMPS OR WEDGES. A. V. Stephens and G. A. Collins. May 1955. 19p.

Preliminary experiments of a new device for the delay or elimination of turbulent separation are described. The device is essentially a means of redistributing the total pressure in a boundary layer by means of wedge-shaped excrescences on the surface. The operation of boundary layer wedges for controlling turbulent separation was investigated in an adverse pressure gradient on the upper surface of a wing. A new type of wedge in the form of a flat ramp was developed, and was applied to various wings and flaps with significant improvements in the lift characteristics. (auth)

7618 AD-54059

California Inst. of Tech., Pasadena. Hydrodynamics Lab.

THE GROWTH AND COLLAPSE OF VAPOR BUBBLES. Report No. 21-19. S. A. Zwick. Dec. 1954. 106p. Contract N6onr-24420.

A theory is developed which describes the behavior of a vapor bubble in a liquid. Its physical basis is the assumption that the heat transfer effects which accompany the evaporation occurring at the bubble wall when the bubble grows, or the condensation that occurs there when the bubble collapses, are dynamically important. The basic equations of hydrodynamics are shown to reduce, for the problem under consideration, to a dynamic equation which describes the behavior of the bubble wall, and a heat convection equation for the liquid which is coupled to the dynamic equation by a boundary condition at the bubble surface. A solution for the heat problem is obtained under the assumption that significant temperature variation in the liquid occurs only in a thin thermal boundary layer surrounding the bubble wall. An estimate of the correction to the temperature solution is also derived. Once the temperature at the bubble wall is given, the vapor pressure within the bubble is known and the dynamic problem becomes determinate. The theory is applied to the cases of the growth of a vapor bubble in a superheated liquid, and the collapse of a vapor bubble in a liquid below its boiling temperature at the external pressure. The simplifying physical assumptions made in the course of the investigation are justified for the specific example of vapor bubble behavior in water. A comparison of the theory with experiment is given for the observable range of bubble growth in superheated water, and the agreement is found to be very good. (auth)

7619 AD-63575

Princeton Univ., N. J. Forrestal Research Center.

BIBLIOGRAPHY ON BOUNDARY LAYER CONTROL. Literature Search No. 6. Maurice H. Smith, comp. Jan. 14, 1955. 114p.

A bibliography is presented based upon material in the Forrestal Research Center Library and several other sources. While the emphasis has been upon the period from 1950 to late 1954, earlier papers have been included to give a more complete survey in one place of material pertaining to boundary layer control by mechanical means, which it is hoped will be of current value. Corollary material on flow visualization, the electric analogy, and injection pumps is included in separate sections. Some papers on geometric control have been included. Except for the special subject categories, the material has been listed by the country of origin. Abstracts have been provided for about two-thirds of the papers listed. Subject and author indexes have been included. (auth)

7620 AD-70394

Stanford Univ., Calif.

FLOW LOSSES IN HEAT EXCHANGERS WITH OBLIQUE FLOW DUCTS—A SUMMARY OF AVAILABLE DESIGN INFORMATION. Technical Report No. 25. D. C. Baxter. June 1955. 46p. Contract N6onr-251, Task Order 6.

The use of compact, high performance surfaces, in gas-to-liquid and particularly gas-to-gas heat exchangers can result in cores of awkward shape when limitations on the allowable flow pressure drops are observed. Consequently, in order to obtain an overall heat exchanger design of reasonable compactness it becomes expedient to fold the core in some manner to form a more suitable shape. The use of such folded cores, where the fluid stream is turned and decelerated on entering and accelerated and turned again on leaving the core, can introduce additional flow stream mechanical energy losses which may in magnitude approach the heat exchanger core flow friction. The purpose of this preliminary report is to phrase the problem from the point of view of the heat exchanger designer, and to present a review of information already available in the literature. Later reports will present the results of experimental investigations now underway. (auth)

7621 AERE-T/M-136

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

EFFECT OF REACTOR FLUX ON BOILING WATER. W. M. Lomer. Apr. 1956. 13p.

The detailed behavior of any boiling system depends quite strongly on the supply of suitable nucleation sites where small vapor bubbles may form. The highly localized deposition of the kinetic energy of protons and oxygen ions which have been knocked on by the neutron flux in a reactor could serve as a nucleating agent under some circumstances. It is shown here that this could not be expected in water boiling at atmospheric pressure, but that at 600 psi it is impossible at present to state whether there will be any such effect, or its significance as far as heat transport is concerned. It is also argued that there is little significance for reactor kinetics in the fact that 5% of the fission energy is carried in long range neutron and γ radiation, thus by-passing some thermal conduction delays. (auth)

7622 KAPL-P-1511

Knolls Atomic Power Lab., Schenectady, N. Y.

RECLEANING SODIUM HEAT TRANSFER SYSTEMS. W. H. Bruggeman, H. F. Karnes, and F. C. Hanny. [1956].

31p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

Both steam and alcohol are useful techniques for the removal of sodium residues from piping systems and components. The principal disadvantage of steam recleaning is the possibility of high temperature excursions due to the low heat capacity of the steam. Tests have been conducted in which these temperature rises are minimized by dilution of the steam with an inert gas. This humid gas technique is recommended for recleaning operations where the use of steam would be preferable to alcohol and where local over-temperature could result in system equipment damage. (auth)

7623 KAPL-P-1512

Knolls Atomic Power Lab., Schenectady, N. Y.

AN EVALUATION OF THE SODIUM–WATER REACTION IN HEAT TRANSFER SYSTEMS. D. D. Adams, G. J. Barenborg, and W. W. Kendall. [1956]. 32p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

A review of sodium–water reaction experiments forms a basis for estimating the effects of chemical reaction resulting from potential leakage. System design recommendations to minimize the effects of leakage are also presented. (auth)

7624 LEO/A-63

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A STUDY OF THE TRANSIENT BEHAVIOUR OF HEAT EXCHANGERS. R. W. Sutton. Oct. 5, 1955. 30p.

Consideration is given to the partial differential equations representing the behavior of the heat exchanger with particular reference to the case in which the secondary side fluid is saturated steam. The representation of the partial equations by their finite difference equivalents is given and it is shown that these latter equations can be readily represented on an electronic analogue computer. A number of approximations to the equation are considered to determine to what extent the required analogue may be simplified in order to give an economic analogue when considering the heat exchanger as part of a complete power producing plant. The reasons for the rejection of most of these approximations are given. It is shown that, at least for a preliminary consideration of an over-all power plant, it is sufficient to work in terms of the temperatures at the inlet, center and outlet of the heat exchanger, the errors resulting from this approximation being less than 1% in temperature and approximately 10% in steam flow. (auth)

7625 NACA-TN-3669

Ames Aeronautical Lab., Moffett Field, Calif.

PERFORATED SHEETS AS A POROUS MATERIAL FOR DISTRIBUTED SUCTION AND INJECTION. Robert E. Dannenberg, Bruno J. Gambucci, and James A. Weiberg. Feb. 6, 1956. 27p.

Measurements were made of the resistance to air flow through a series of perforated metal sheets with open areas ranging from less than 1% up to 41%. The use of punch-perforated sheets as a porous material for boundary-layer-control applications by means of distributed suction is discussed. (NACA abst.)

7626

HEAT TRANSFER THROUGH A HOMOGENEOUS ISOTROPIC TURBULENT FIELD. Thomas J. Hanratty (Univ. of Illinois, Urbana). A.I.Ch.E. Journal 2, 42-5(1956) Mar.

The effect of the time dependency of the diffusion process is examined for the case of heat transfer from a hot wall to a cold wall through a turbulently flowing fluid. The fluid is assumed to have a uniform velocity and the turbulence is assumed to be homogeneous and isotropic. The calculations are carried out by assuming a distribution of heat sources along the hot wall and of heat sinks along the cold wall. A theory of turbulent diffusion for a homogeneous isotropic field is used to describe the properties of these sources and sinks. These calculations are compared with temperature profiles obtained as a solution to Fick's Law using a constant diffusion coefficient. A marked difference between the two sets of curves is obtained in the vicinity of the wall and in the beginning of the heat exchange section. A calculated profile on the basis of an idealized model of heat transfer in channel flow is compared with actual measurements at a distance far enough downstream so that the temperature profile had reached a steady condition. (auth)

7627

PRESSURE DROP THROUGH POROUS MEDIA. PART V. L. E. Brownell, D. C. Gami, R. A. Miller, and W. F. Nekarvis. A.I.Ch.E. Journal 2, 79-81(1956) Mar.

Fluid flow data are presented for beds of uniformly sized spheres consolidated with resin over a porosity range from 36.4 to 12.3%. The data are analyzed in terms of an effective pore volume and equations are given for predicting pressure drop by use of a friction-factor-Reynolds-number plot. (auth)

7628

MASS TRANSFER IN A WETTED-WALL COLUMN: TURBULENT FLOW. W. H. Schwarz and H. E. Hoelscher (Johns Hopkins Univ., Baltimore). A.I.Ch.E. Journal 2, 101-6(1956) Mar.

Concentration profiles of water vapor in a wetted-wall column with fully developed turbulent pipe flow of air for several positions downstream of the inlet. The air Reynolds number was 25,000. The mathematical formulation of this problem involved the Navier-Stokes equations and the mass transfer equation with a boundary condition of constant concentration at the wall. No attempt has been made toward an analytical solution of this problem, as the exact solution of the turbulence problem has not been developed. Instead, values of the mass and momentum transfer correlation, $\overline{u_r h}$ and $\overline{u_r u_z}$, have been computed as a function of the radius. The eddy diffusivity for momentum and mass and the local mass transfer rates are shown for engineering purposes. (auth)

7629

ON DETERMINATION OF THERMAL CONDUCTIVITY COEFFICIENT RELATION TO TEMPERATURE. L. A. Vulis and V. A. Potseluĭko. Zhur. Tekh. Fiz. 26, 76-84 (1956) Jan. (In Russian)

Analysis of the thermal conductivity coefficient relation to temperature produced the selection of the characteristic mean temperature. Calculations of mean temperature for stationary and Malmgren-Shuleĭkin methods are discussed. Several methods are suggested for determining the relation of thermal constants with temperature. Results of experiments with sands in the temperature interval of 20 to 300°C are given. (R.V.J.)

7630

DETERMINATION OF THE THERMAL CONDUCTIVITY COEFFICIENT FOR FREE FLOWING MATERIALS BY MAL'MGREN-SHULEĬKIN METHOD. Y. A. Vulis, N. D. Kosov, and V. A. Potseluĭko. Zhur. Tekh. Fiz. 26, 84-9 (1956) Jan. (In Russian)

The Mal'mgren-Shuleĭkin method for determination of the thermal conductivity coefficient of ice is adapted for determination of the thermal conductivity coefficient of free flowing materials. This method gave sufficiently accurate results in checking small thermal flow, consequently, it can be used also in determination of the thermal conductivity coefficient for materials which have low melting points and which disintegrate at high temperatures. The method is

recommended for determination of thermal characteristics of various materials. (R.V.J.)

7631

EQUATION OF THE TURBULENT BOUNDARY LAYER IN GAS, TRANSFORMED TO ORDINARY LINEAR EQUATIONS AND THEIR SOLUTION IN FINITE FORM. L. E. Kalikhman. Doklady Akad. Nauk S.S.S.R. 106, 401-4(1956) Jan. 21. (In Russian)

The transformation does not demand any assumption of field velocities, boundary layer temperatures, or mechanical turbulence. Therefore, the calculations of the boundary layer are made by simple quadratics. (R.V.J.)

7632

USE OF RADIOACTIVE ISOTOPES FOR MEASURING GAS FLOW VELOCITIES AND FOR THE AUTOMATIC CONTROL OF GAS FLOW BY "LABELED MOLECULES". N. N. Shumilovskiĭ, and L. V. Mel'ttser (Inst. of Automatics and Telemechanics). Doklady Akad. Nauk S.S.S.R. 106, 661-4(1956) Feb. 1. (In Russian)

A "labeled molecule" method for measuring flow velocities and for automatic control of gas flow is adapted for technical use. The source of radioactive ionization is placed in a special container outside of the pipe, thus it does not have any direct contact with the investigated media. The flow of radiation is modulated so that it "penetrates" periodically through the pipe at short intervals of time. Consequently, inside of the pipe, ionized media are created which are transferred by the flow. A receiver, placed under the flow, checks the passing of the ionized medium, and a special installation records the time between the generation of ionization and its passage in front of the receiver. Isotopes used within the limits of their natural decay do not contaminate the investigated media. The method of labeled atoms contains excited atomic nuclei emitting radioactive isotopes, while the "labeled molecule method" is a collection of ionized molecules, excited by radioactive isotopes, which are not themselves radioactive but are easily captured by a sensitive receiver. The method was developed by using the strongly ionizing α particles. (R.V.J.)

Refer also to abstracts 7795 and 7828.

MATERIALS TESTING

7633 AERE-C/R-345

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

EXPERIMENTS ON THE STRENGTH OF GLASS AFTER FAST NEUTRON IRRADIATION. J. Wright and D. W. Brook. May 1949. 33p.

Thin rods of various glasses were irradiated inside a hollow U cylinder near the centre of GLEEP. They were then tested to destruction by loading the mid-point of each rod while it was supported horizontally on two knife-edges. The results of these tests were compared with those on similar unirradiated glass rods. Soda glass, lead glass, Phoenix, Pyrex, Hysil, and fused silica were studied. The changes in bending strength due to fast neutron irradiation up to 54 Mw-hr were small and not always significant because of the wide variation found within a set of similarly treated specimens. After 54 Mw hr irradiation, soda glass showed a significant decrease in bending strength from 8.9 tons/in.^{2} to 8.0 tons/in.^{2}, and fused silica a significant increase in strength from 6.5 to 7.5 tons/in.^{2} The increase in strength shown by Phoenix was barely significant. Impact strength of glass tubes was also studied on a few specimens before and after irradiation by dropping a steel weight on to the tubes from increasing heights until rupture occurred. No significant changes which could be attributed definitely to irradiation effects were observed. Some observations on the colors in ordinary white light and the fluorescence under excitation by near ultraviolet light are noted for the irradiated and unirradiated specimens of glass rod. (auth)

7634 TML-38

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

MATERIAL PROPERTIES FOR DESIGN OF AIRFRAME STRUCTURES TO OPERATE AT HIGH TEMPERATURES. L. R. Jackson. Mar. 23, 1956. 64p. Contract AF18 (600)-1375.

Mechanical and physical properties of structural materials are discussed with the idea of reevaluating their usefulness for high-temperature design. The extent of available data on typical metallic materials is also discussed. (auth)

7635 WADC-TR-53-83(Pt. 4)

Standard Oil Co. of Indiana, Whiting.

DEVELOPMENT AND EVALUATION OF HIGH TEMPERATURE GREASES. [Period covered] October 10, 1954 to October 10, 1955. Edward A. Swakon. July 1956. 59p. Project title: AVIATION LUBRICANTS. Task title: AIRCRAFT LUBRICATING GREASES. Contract AF33 (038)-23687.

The development of an aircraft grease suitable for use over the temperature range from −65 to 450°F and higher with emphasis placed on the development and evaluation of arylurea greases made with the best available fluids and the development of thickeners for use as high as 700°F were continued. The grease selected to replace MLG-9305 consists of DC 550 Silicone Fluid thickened with para-tolyl and para-chlorophenylurea derivatives of bitolylene-diisocyanate. The corresponding grease made with DC XF 258 Silicone Fluid was designated MLG-9360 and comes closest to meeting the proposed requirements for a grease for the temperature range from −65 to 450°F. Arylurea grease of Hercoflex 600 (polyester) is the best choice for a grease for use from −65 to 350°F with good lubricity; bearing performance at 350°F averaged about eight times longer than that obtained with MIL-G-3278 greases. Pteridine derivatives were the most promising compounds uncovered during this period for thickeners for use in greases in excess of 450°F and as high as 700°F. An anti-oxidant, MLC-55-535, was at least as good as phenothiazine or dilauryl selenide in ester greases. An antiwear agent, MLO-55-499, in silicone greases was effective in reducing wear in the Navy gear-wear test, but not enough to pass the requirements under the ten-pound-load conditions. (auth)

7636 WADC-TR-53-337(Pt.3)

Southwest Research Inst., San Antonio.

POLYNUCLEAR AROMATIC COMPOUNDS FOR HIGH TEMPERATURE LUBRICANTS. Technical Report No. 13. Final Report for period from November 20, 1954 to November 20, 1955. Charles F. Raley, Jr. Feb. 1956. 56p. Project Title: RUBBER, PLASTIC AND COMPOSITE MATERIALS. Task Title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-276.

Investigations were continued on the high-temperature properties of aryl phosphate esters and phenol-$POCl_3$ reaction products. It was found that thermal and oxidative stability do not necessarily go together. Results indicated that the oxidation of aryl phosphates may be inhibited by the addition of heterocyclic phosphates. (C.W.H.)

7637 WADC-TR-56-168

General Electric Co. Silicone Products Dept., Waterford, N. Y.

SILICONE FLUID RESEARCH FOR THE DEVELOPMENT

OF HIGH TEMPERATURE HYDRAULIC FLUID AND ENGINE OILS. [Period covered] March 1955 to March 1956. Edgar D. Brown, Norman G. Holdstock, and John M. McGuire. Mar. 1956. 132p. Project titles: HYDRAULIC FLUIDS and AVIATION LUBRICANTS. Task titles: HYDRAULIC FLUIDS and LUBRICANTS. Contract AF33 (616)-2899.

Work was continued on the development of a 700°F hydraulic fluid and engine oil. Varied studies of formulation, new compounds, and new silanes were made for the improvement of a chlorophenylmethylsiloxane system. A large number of additives were evaluated for their improvement of lubricity, oxidation stability, thermal stability, and foaming. (auth)

7638

MEASURE HEAVY FORCES TO AVOID EXCESSIVE BOLT LOADING IN MODIFIED CYCLOTRON. D. T. Scalise (Univ. of California, Berkeley). Iron Age 176, No. 17, 85-7(1955) Oct. 27.

Magnetic forces of about 2 million lb must be held by high-strength bolts used in the modified cyclotron at the University of California'a Radiation Laboratory. Unless the cyclotron pole plates are tight, the magnetic forces separate them further. To overcome this tendency, the pole bolts are preloaded. A special sensing element measures the full-size forces which could not be duplicated from a scale model. (auth)

Refer also to abstract 7625.

PUMPS

7639 NP-5912

Mine Safety Appliances Co., Callery, Penna.
CALCULATION OF DEVELOPED PRESSURE AND FLUID POWER IN LINEAR POLYPHASE INDUCTION LIQUID METAL PUMPS. Technical Report No. 48. R. S. Baker. Mar. 24, 1956. 67p. Contract NObs-65426.

The following factors which affect the performance of linear polyphase induction liquid metal pumps are discussed: frequency of the power source; speed of the traveling field; electrical power losses due to harmonic losses of the traveling magnetic field; and "end effects" due to the stationary fields at each end of the pump. Formulas are given for calculating the pressure developed in liquid metal, by the action of a traveling magnetic field in a linear polyphase induction pump, and the electrical power loss in the liquid metal caused by the traveling field. Equations for obtaining maximum shut-off pressure by varying pump dimensions are also presented. An example of the application of these equations to pump design is included. (auth)

7640

FREEZE-SEAL VALVES AND PUMPS. R. Cygan and A. M. Stelle (North American Aviation, Inc., Canoga Park, California). Chem. Eng. Progr. 52, 157-9(1956) April.

Freeze seals have been developed for sealing stationary and rotating shafts affording a simple means of adapting commercial equipment for use in high-temperature liquid-metal systems. Several designs for sealing sodium at temperatures up to 1200°F have been satisfactorily tested. Under different operating conditions cooling loads, torque, and temperature distribution were measured. Locating the freeze seal away from the high-temperature region allows the formation of an annulus of frozen metal around the shaft with small cooling loads. (auth)

TRACER APPLICATIONS

7641

TRACERS LOCATE ENTRAINMENT IN DISTILLATION UNITS. C. D. Wagner, H. R. Lukens, Jr., and R. R. Hughes (Shell Development Co., Emeryville, Calif.). Nucleonics 14, No. 4, 78-83, 128(1956) Apr.

The use of tracers to locate entrainment in refinery distillation units is discussed. For this type of study, the use of Ba^{140}-La^{140} was recommended as the tracer element, and the proposed techniques were applied to the study of a refiner vacuum flasher unit. Results of entrainment tests are described in detail. (B.J.H.)

VACUUM SYSTEMS

7642

FAST-CLOSING VACUUM VALVE. Arthur W. Knudsen (Stanford Univ., Calif.). Rev. Sci. Instr. 27, 148-50(1956) Mar.

A swinging-gate type valve with associated triggering mechanism is employed as a protective device for quickly stopping a sudden accidental inrush of air to a vacuum system. The electrical triggering mechanism uses no vacuum tubes. For a large inrush of air, the valve will close in less than 0.01 sec. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

7643 AD-61492

American Lava Corp., Chattanooga.
A STUDY AND EVALUATION OF METHODS OF PRODUCING A CERAMIC-TO-METAL SEAL BY PRESSED POWDER TECHNIQUES FOR AUTOMATIC MASS PRODUCTION. Monthly Report No. 6 for the Period February 1, 1955 to March 1, 1955. Harry C. Dunegan. Mar. 1955. 13p. Contract AF 33(600)-27329.

The object of this project is to "study and evaluate methods of producing a metal-ceramic body of the cylinder type having both ends metallized by means of a pressed powder technique, and best suited for automatic production." The units are to be vacuum tight. The largest number of failures in the vacuum testing trials were a result of poor solder flow. All of the metal parts were slightly oxidized and the surfaces had to be ground to remove this film prior to soldering. In some cases the grinding exposed the underlying ceramic, while in others some of the film was not removed completely. Vacuum failures occurred at these points where solder did not flow. Metal surfaces sintered during recent firings in the reconditioned atmosphere have been successfully wet with the gold–nickel solder without any additional cleaning. Thus, it appears that if the purifying system functions properly the solder flow should no longer be a major problem. This leaves the pressing defects as the next most important obstacle. The "carbide" die did not eliminate all of the cracks or spalling but indications were that a binder change in combination with the carbide die had possibilities of removing these defects, providing a suitable binder could be found for the metal powders. Binders that worked for the ceramics did not help the metals. (auth)

7644 AD-66226

American Lava Corp., Chattanooga.
A STUDY AND EVALUATION OF METHODS OF PRODUCING A CERAMIC-TO-METAL SEAL BY PRESSED POWDER TECHNIQUES FOR AUTOMATIC MASS PRODUCTION. Monthly Report No. 8 for the period April 1, 1955 to May 1,

1955. Harry C. Dunegan. May 1955. 15p. Contract AF 33(600)-27329.

Ceramics of alumina and Forstorite containing 9% plasticized polyvinyl alcohol or Ceremul C could be pressed as high as 30 tons/in^2. Dew points plotted as a function of temperature revealed variations characteristic of the fired material. Dielectric measurements were not reliable. In firing trials run on stainless Steel Powders with W, Ni, and Cu and the above ceramics, metal shrinkages were less than ceramic shrinkage and alumina bodies were more distorted than Forstorite bodies. Bonding was good. (F.S.)

7645 NP-6029

Pittsburgh. Univ. Sarah Mellon Scaife Radiation Lab.
EQUIPMENT FOR X-RAY CRYSTAL STRUCTURE ANALYSIS. I. A STUDY OF THE EULERIAN CRADLE FOR SINGLE CRYSTAL INTENSITY MEASUREMENTS WITH THE XRD-3 OR XRD-5 DIFFRACTOMETER AND ASSOCIATED EQUIPMENT. G. A. Jeffrey and G. E. Pringle. II. THE DIRECT RECORDING OF SCALED COUNTER INTENSITIES FOR X-RAY CRYSTAL STRUCTURE ANALYSIS. G. E. Pringle. III. A SIMPLE ADAPTATION OF THE XRD-3 FOR DIRECT RECORDING OF X-RAY INTENSITIES. J. R. Townsend. Final Report on RESEARCH AND DEVELOPMENT ON THE ELECTRON DENSITY DISTRIBUTION IN SEMI-CONDUCTORS. Period Covered: February 1 through December 31, 1955. 32p. Project 5B-99-01-004. Contract DA-36-061-ORD-463.

Aluminum nitride, BeO, and ZnO were analyzed with the purpose of obtaining x-ray intensities on single crystals with a degree of accuracy of the order of 1 to 2%. This would enable one to explore the fine details of comparatively simple structures and lead to more accurate determination of intensities of more complicated structures than would be possible by photographic methods in a comparable period of time. Diagrams and techniques are presented. (R.V.J.)

7646 RAE-TN-CHEM-1264

Gt. Brit. Royal Aircraft Establishment, Farnborough, Hants, England.
NON-STOICHIOMETRY AND METAL OXIDES. I. David. Sept. 1955. 21p. (AD-83592).

The causes of non-stoichiometry in heteropolar compounds are surveyed, emphasis being laid on the relationship between non-stoichiometry and the crystal structure of these substances. The structural characteristics of metal oxides are outlined, and the magnetic and electrical properties of some classes of oxide explained in terms of their crystal structure. (auth)

7647 WADC-TR-53-9(Pt.2)

Pennsylvania State Univ., University Park.
REFRACTORY MATERIALS FOR USE IN HIGH-TEMPERATURE AREAS OF AIRCRAFT. PART 2. OXIDE-BASE AND CARBIDE-BASE MATERIALS. Norman R. Thielke. Sept. 1954. 57p. Contract AF 33(038) 16375 (17284). (AD-48907).

The study of selected carbide systems and examination of thermal shock testing procedures was initiated. Work with oxide-base materials included investigations of the effects of various metal oxide additions on the crystallographic inversions in SiO_2, $AlPO_4$, and ZrO_2; the temperature dependence of the modulus of elasticity determined by the sonic method; the improvement of the mechanical strength and thermal stability of aluminum titanate bodies; and the thermal conductivity, thermal shock resistance, and thermal expansion behavior of aluminum titanate. Among RO_2-type oxide additions to SiO_2, only TiO_2 was effective in suppressing the low-to-high inversion of cristobalite, the temperature being reduced from 225°C to approximately 120°C. Mixtures of $AlPO_4$ and $SiSiO_4$ had lower inversion temperatures than either end member by itself. SiO_2 had little effect on the inversion temperature of ZrO_2. Curves for the temperature variation of dynamic modulus of elasticity determined by a sonic method were presented for 75-S aluminum alloy, SAE 1010 steel, fused silica, Armco iron, soft glass, Linde sapphire, magnesia, titanium dioxide, magnesia spinel, steatite, and a vitrified and semi-vitrified whiteware body. It was shown that aluminum titanate may be stabilized by isomorphous substitutions of iron titanate and magnesium dititanate. The thermal conductivity of aluminum titanate rings was measured, the mean value being approximately 1.11 kcal/m°C hr. Measurement of directional thermal expansion of aluminum titanate by high temperature x-ray powder methods gave coefficients of +118, +194, and -26×10^{-7} for the a, b, and c coordinate directions in the interval 25 to 970°C. The work concerning carbides mainly involved construction of a Gartland-type carbon tube resistor furnace for investigation of compositions in the system TaC–NbC–TiC. It was shown that two factors must be used to characterize the thermal shock resistance of materials, the thermal conductivity, k, and the thermal stress resistivity, $S/E\alpha$. A method for the determination of these factors was described. (auth)

7648 AEC-tr-2512

X-RAY INVESTIGATION OF PSEUDOBINARY SYSTEMS: TaC–TiC, NbC–TiC, TaC–ZrC, NbC–ZrC. A. E. Kovalskii (Kovalsky) and Ya. S. Umanskii (Umansky). Translated from Zhur. Fiz. Khim. 20, 769-72(1946). 8p.

TaC–TiC, TaC–ZrC, NbC–TiC, NbC–ZrC formed a continuous series of solid solutions among themselves. At a component ratio of 1:1 the interference lines were very diffuse. Additional calcination for 12 hr did not alter the character of the lines, which indicates that the cause of the diffuseness of the lines is not the absence of equilibrium but a strong distortion of the lattice structure. The lattice spacing results obtained by x-ray analysis for the initial carbides and solid solutions did not agree with the data published by Becker. (auth)

7649 AEC-tr-2513

REACTION OF MONOCARBIDES OF TUNGSTEN, TANTALUM AND NIOBIUM (X-RAY ANALYSIS). II. A. E. Kovalskii (Kovalsky) and Ya. S. Umanskii (Umansky). Translated from Zhur. Fiz. Khim. 20, 773-8(1946). 13p.

The solubility of WC in TaC and NbC increases considerably with increase of temperature, reaching mol. 75% at 2500°. Conversely, the solubility of TaC and NbC in WC is extremely small, but it also increases with increase in temperature. The solubility of TiC in WC was also established. No special points were found which might have indicated the presence of a compound $TaWC_2$. Annealing brought about the break up of supersaturated solid solutions and caused a second phase to separate out (in this case WC) in an extremely disperse state and the incubation period of break up varied with respect to the annealing temperature. Thus, the present investigation showed that the phenomenon of aging, widely known and used for the thermal treatment of alloys in ferrous and non-ferrous metallurgy, is also important in the field of hard alloys. This permits the potentialities of thermal treatment of our most effective modern hard alloys to be fully exploited. (auth)

7650

STUDY OF Al_2O_3–SiO_2–ZrO_2. P. P. Budnikov, and A. A. Litvakovskiĭ. Doklady Akad. Nauk S.S.S.R. 106, 267-70 (1956) Jan. 11. (In Russian)

An invariant point at which all three compounds recrystallized simultaneously was found at 1800° with the chemical content of 53% Al_2O_3, 17% SiO_2, and 30% ZrO_2. This chemical

content showed the best crystallization inherent to the eutectic composites, uniformity of crystal size, and better resistance to corrosion. (R.V.J.)

7651

LIQUEFACTION IN ZrO_2–SiO_2 SYSTEM. N. A. Toropov and F. Ya. Galakhov (Inst. of Silicate Chemistry). Izvest. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk, 158-61(1956) Feb. (In Russian)

Investigations were made of ZrO_2–SiO_2 at 1800 to 2500°C. It was established that $ZrSiO_4$ melts into zirconium dioxide and silicon dioxide. The liquefaction in the system was observed at high temperatures. The temperatures and concentrations at which the two liquids coexist, and a diagram of ZrO_2–SiO_2 state at high temperatures are given. (R.V.J.)

7652

LOW-TEMPERATURE HEAT CAPACITY AND ENTROPY OF MOLYBDENUM TRIOXIDE AND MOLYBDENUM DISULFIDE. D. F. Smith, Duane Brown, A. S. Dworkin, D. J. Sasmor, and E. R. Van Artsdalen (Oak Ridge National Laboratory). J. Am. Chem. Soc. 78, 1533-40(1956) April.

The heat capacities of crystalline MoS_2 and MoO_3 have been measured down to about 18°K. Both substances have layer-lattice structure and exhibit approximately T^2 dependence of C_p between 20 and 60°K. Because of the T^2 behavior prior extrapolations by the T^3 law below 50°K are in error. Corrected values are given for S^0 and ΔH^0_f. (auth)

7653

HIGH-TEMPERATURE PARTS BASED ON TITANIUM CARBIDE. Walther L. Havekotte (Firth Sterling Inc., Pittsburgh). Metal Progr. 69, No. 4, 56-62(1956) Apr.

Titanium carbide-base cermets were prepared which exhibited good corrosion resistance and stress-rupture strength but low impact resistance. (C.W.H.)

Refer also to abstract 7599.

CORROSION

7654 AERE-C/M-272

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE STATIC CORROSION OF NICKEL AND OTHER MATERIALS IN MOLTEN CAUSTIC SODA. J. N. Gregory, N. Hodge, and J. V. G. Iredale. Mar. 1956. 15p. (RCTC-P/62).

Nickel is a satisfactory container material for molten caustic soda in the temperature range 320 to 580°C, with a mean corrosion rate of about 10 mdd. Above 580°, corrosion is much more rapid. Of the various additions made to molten caustic soda, only LiOH gives a reduction in the corrosion rate. The mean rate of corrosion of Ni in a LiOH/NaOH eutectic mixture between 220 and 580°C is about 2.0 mdd, but this advantage does not extend to temperatures above 600°C. The nickel-base alloys, Inconel, Hastelloy D, and Duranickel have a slightly higher corrosion rate than commercial Ni but have the advantage of better mechanical properties. The only other resistant materials are Al, Ag, Pt, and, to some extent, Zr, and the ceramics, thoria and alumina. (auth)

7655 LA-1993

Los Alamos Scientific Lab., N. Mex.

MATHEMATICAL ANALYSIS OF GALVANIC CORROSION. PART VI. ELECTRODE SYSTEMS WITH CYLINDRICAL GEOMETRY. John M. Ruth and James T. Waber. Sept. 12, 195[5]. 31p. Contract W-7405-eng-36. $0.25(OTS).

Several galvanic systems with electrodes lying in a cylindrical surface were studied and the potential distribution in an annularly shaped electrolyte has been expressed as a series in all but one case. In it, a closed expression involving elliptic functions was derived for unpolarized anodes and cathodes lying axially along the cylinder. However, a Fourier-Bessel series was needed to represent the potential when significant polarization occurred at the two electrodes. A different, but formally similar, Fourier-Bessel series was employed in the case of ring electrodes with their junctions lying in planes perpendicular to the cylinder axis. In one instance, involving infinite cathode lengths, the problem was treated as a limiting case and the series for finite dimensions was transformed to a Fourier-Bessel integral. The sign in front of the derivative in the Wagner boundary condition equation $P^*(x,R) \pm \mathcal{P}(\partial P^*/\partial r)|_{r=R} = P(x,R)$ changes and, for example, is positive when the annulus of electrolyte is inside the electrode cylinder. It depends on whether the radius vector and the outward drawn normal vector lie in the same or opposite directions. This equation is generalized and the use of a single notation is discussed. Formal expressions for the interfacial potentials and the dimensionless corrosion current parameter has been derived. The radial dependence differs from case to case, and the various forms are tabulated. (auth)

7656 NP-5936

Mine Safety Appliances Co., Callery, Penna.

CORROSION OF ZIRCONIUM IN 1000 F SODIUM. Memo Report No. 110. S. J. Rodgers and J. W. Mausteller. Apr. 23, 1956. 5p. Contract NObs-65426.

The corrosion of Zr was studied as a function of oxygen concentration in 1000 F sodium flowing at 3 fps in a Ni system. The corrosion rate varied from 0.8 mg/cm²-mo at 0.005 wt % O_2 to 1.0 mg/cm²-mo at 0.036 wt % O_2. Samples were covered with a black film and all showed weight gains. (auth)

7657 WADC-TN-55-178

Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.

AN ELECTRICAL CONDUCTANCE TEST METHOD FOR MEASURING CORROSION. D. Roller. Aug. 1955. 33p. (AD-84804).

An investigation was made of a sensitive test method for determining the rate and amount of corrosion of a metal specimen by measuring the corroding specimen's change in electrical conductance. Statistical analysis of initial tests made using pure Mg ribbon showed that results obtained by this method are comparable to results obtained by other, more conventional, corrosion methods. Equipment used in the tests is described and illustrated, and advantages of the method are summarized. (C.H.)

7658 WAPD-A1W(PCh)-46

Westinghouse Electric Corp. Atomic Energy Div., Pittsburgh.

INVESTIGATION OF UNCLAD CARBON STEEL FOR PRESSURIZER APPLICATIONS. Paul E. Brown and Kurt Katz. Jan. 25, 1956. 60p.

Bound with this report with separate pagination is WAPD-A1W(PCh)-55: EXAMINATION OF CARBON STEEL PRESSURIZERS. C. F. Paulson. nd. 3p.

Unclad carbon steel for use in the A1W pressurizer was studied in the liquid, alternate liquid and vapor, and vapor phases using air and steam start-ups. Air caused serious corrosion but no excessive corrosion was caused by steam. The presence of ammonia reduces the liquid phase corrosion rate but does not affect the corrosion rate in the other phases. Oxygen concentrations of 2 to 6 cc/kg of water are tolerable for steam pressure start-ups. (F.S.)

7659 AEC-tr-2504

THEORY OF SCALE PROCESSES ON METALLIC ALLOYS. Karl Hauffe. Translated from Arch. Eisenhüttenw. 24, 161-71(1953). 33p.

Scale formation processes at elevated temperatures are

studied to determine the disorder and diffusion phenomena in O_2, S, and halide films. Specimens of Fe, Cu, Ni, Ti, Zn and their alloys were investigated. It has been found that these phenomena can be quantitatively described on the basis of Wagner's scale theory. (R.V.J.)

7660 AERE-Lib/Trans-705
THE PASSIVITY OF IRON IN NEUTRAL AND SLIGHTLY ACID SOLUTIONS. K. G. Weil and K. F. Bonhoeffer. Translated by F. Hudswell from Z. physik. Chem. (Frankfurt) (N. F.) 4, 175-91(1955). 17p.

The passive state of Fe in aqueous solutions with pH varying from 2 to 6 was investigated. Results indicated that different passivation processes occur in neutral and acid solutions. The higher stability of the passive state in neutral solutions was attributed to low corrosion rate and mixed oxide formation. (C.W.H.)

7661 AERE-Lib/Trans-706
THE CORROSION OF PASSIVE IRON IN ACID SOLUTION. K. J. Vetter. Translated by F. Hudswell from Z. Elektrochem 59, 67-72(1955). 14p.

7662
OXIDATION OF ALUMINUM IN THE TEMPERATURE RANGE 400°–600°C. W. W. Smeltzer (Aluminium Labs. Ltd., Kingston, Ont., Canada). J. Electrochem. Soc. 103, 209-14(1956) Apr.

The surface oxidation kinetics of metallographically polished high purity aluminum were studied in the temperature range 400° to 600°C using a vacuum microbalance technique. The oxidation rate of aluminum decreased to a low value after a formative stage of film growth which was governed by a parabolic law. Values of the activation energies of reaction were determined from the temperature coefficient of the parabolic law constants and were compared with other values reported in the literature. By attaching equal significance to gaseous and anodic oxidation results, a value of 37.2 kcal/mole (1.6 ev) was determined for the potential energy barrier against ion diffusion at the metal/oxide interface. (auth)

7663
EROSION OF STEEL BY HOT GASES. M. J. Fraser and A. A. Burr (Rensselaer Polytechnic Inst., Troy, N. Y.). J. Electrochem. Soc. 103, 224-31(1956) Apr.

A vent-plug device for producing eroded surfaces on steel and other metals is described. Surfaces so treated have been shown by metallographic and x-ray analysis to duplicate structures encountered in many service applications. During the erosion of steel, as many as five distinct surface layers are produced. Retention of austenite in these eroded surfaces is an indication of the chemical alteration of the surface layers during erosion. The major portion of the investigation is concerned with a modified SAE 4330 steel. However, comparison experiments were made on Armco iron, and SAE 1015, 1040, and 1070 steels. The effect of carbon content on erosion behavior is illustrated by x-ray analysis. (auth)

Refer also to abstract 7694.

GEOLOGY AND MINERALOGY

7664 BM-RI-5204
Bureau of Mines.
BROWN DERBY PEGMATITES, GUNNISON COUNTY, COLO. R. R. McLellan. Oct. 1954. 24p.

The Brown Derby pegmatites are in Gunnison County, Colo., about 18 miles east of Gunnison. Approximately 860 tons of lepidolite concentrates, with smaller amounts of microlite and beryl, were produced from 3 dikes of the Brown Derby group from 1943 through 1947. No mining was done from 1948 until December 1950, when production of lepidolite and beryl was resumed by the Poston Mining & Milling Co. Mining was intermittent during 1951 and 1952. The dikes were mapped and studied by the Federal Geological Survey during the field seasons of 1942 to 1944, and in May 1950 the Bureau of Mines initiated a diamond-drilling project to test the three dikes for lepidolite and beryl. After being recessed twice, the project was terminated indefinitely July 1951. Seven drill holes were completed for a total of 1,841.6 feet of drilling. All core recovered from the pegmatites was split, sampled, and assayed for Li, Be, Ta, Nb, and K. The Geological Survey cooperated by logging the core and preparing geologic maps of the underground workings. Spectrographic, petrographic, and ore-dressing tests were conducted by the Metallurgical Division, Region IV, of the Bureau of Mines on the lepidolite–microlite–beryl ores encountered in the dikes. (auth)

7665 HW-[illegible]273
Hanford Atomic Products Operation, Richland, Wash.
A SCINTILLATION WELL-LOGGING SYSTEM. W. G. Spear and [illegible]. Rankin. May 1, 1956. 19p. Contract W-31-109-Eng-52. $0.20(OTS).

A scintillation well-logging system was developed and fabricated to determine the extent and energies of various gamma emitting isotopes in wells up to 500 feet deep. The system comprises a watertight scintillation probe, a single connecting coaxial cable, a high voltage supply, a linear amplifier, a pulse height analyzer, a count-rate meter, recorder, cable drum, and a variable-speed electric drive unit. Attached to the cable drum are slip rings which convey high voltage to the probe from the high voltage supply and pulses from the probe to the linear amplifier. (auth)

7666 NP-5922
Canada. Dept. of Mines and Technical Surveys. Mines Branch.
MEASUREMENT OF THORIUM IN ORES BY THE THORIUM EMANATION METHOD, Technical Paper No. 14. J. B. Zimmerman and J. A. F. Bouvier. 1955. 24p.

A flow counter for determining the Th content of ores in secular equilibrium is described. Scintillations produced in a ZnS phosphor by α particles resulting from the disintegration of thoron are detected by a photomultiplier tube and registered by a standard scaling unit. The counter response is linear and good sensitivity is obtained. The limit of detection is approximately 0.01% ThO_2. (auth)

7667 NP-5937
Bureau of Mines.
MINERAL FACTS AND PROBLEMS. Bureau of Mines Bulletin 556. 1956. 1046p. $5.75(GPO).

A review and analysis of problems and facts of mineral commodities are prepared in a bulletin form by the U. S. of Bureau of Mines. (R.V.J.)

7668 RME-42(Pt. I)
Grand Junction Operations Office, AEC, Colo.
DRILLING RESULTS AND FAVORABILITY CRITERIA IN BULL CANYON, MONTROSE AND SAN MIGUEL COUNTIES, COLORADO. PART I. R. E. Dickson, R. G. Blair, H. R. Hart, J. V. A. Sharp, and C. D. Thompson. Apr. 1955. 67p.

The Bull Canyon area, tributary to the Dolores River, is in Montrose and San Miguel Counties, southwestern Colorado. The Atomic Energy Commission diamond drilled 844 holes totalling 99,930 feet in the Salt Wash sandstone member of the Jurassic Morrison formation in this area. Practically all the production of uranium–vanadium ore in Bull Canyon comes from the ore-bearing sandstone units, namely the First Rim ore sandstone and

the Third Rim ore sandstone. First orebodies occur from 30 to 60 ft above the base of the Salt Wash; commercial deposits in the Third Rim are found in the interval from 250 to 280 ft above the base of the Salt Wash. The use of various ore guides, or favorability criteria, is explained in the text and illustrated by subsurface favorability maps. (auth)

7669 AERE-Lib/Trans-717

THE FLOTATION OF OXIDISED LEAD ORES AT MESLOULA MINE, ITS PROBLEMS, THE PROGRESS ACHIEVED. M. Lauvernier. Translated by S. W. F. Patching from Rev. ind. minérale 36, 1011-16(1955). 8p.

The problems encountered in the flotation concentration of oxidized Pb minerals due to the great variety of ores treated and to the presence in the flotation pulps of an important amount of mineralized slimes which respond badly and impede the whole flotation are discussed. (auth)

7670 AERE-Lib/Trans-776

THE MINERAL RESOURCES OF EGYPT. M. El-Zoghby. Translated by S. W. F. Patching from Rev. ind. minérale 36, 1072-82(1955). 15p.

7671

THE OCCURRENCE AND PROPERTIES OF METATYUYAMUNITE, $Ca(UO_2)_2(VO_4)_2 \cdot 3\text{-}5H_2O$. T. W. Stern, L. R. Stieff, M. N. Girhard, and Robert Meyrowitz (U. S. Geological Survey, Washington 25, D. C.). Am. Mineralogist 41, 187-201(1956) March-April.

Metatyuyamunite [$Ca(UO_2)_2(VO_4)_2 \cdot 3\text{-}5\ H_2O$], a new mineral, is a dehydration product of tyuyamunite [$Ca(UO_2)_2(VO_4)_2 \cdot 5\text{-}8.5\ H_2O$]. This lower hydrate of tyuyamunite has been collected from more than 35 localities on the Colorado Plateau and from several localities in Fall River County, S. Dak., and Campbell and Johnson counties, Wyo. The optical properties and specific gravity of metatyuyamunite and tyuyamunite are significantly different. Plateaus on the dehydration curve are at values of 5 and 8.5 moles of water per mole of $Ca(UO_2)_2(VO_4)_2$. Metatyuyamunite was rehydrated to tyuyamunite by placing it in a moist atmosphere. The x-ray-diffraction powder patterns of metatyuyamunite and tyuyamunite are distinctly different, indicating a change in phase. Base-exchange studies show that the metatyuyamunite structure may contain several per cent potassium. X-ray-diffraction powder patterns of this base-exchanged product do not reveal the presence of carnotite [$K_2(UO_2)_2(VO_4)_2 \cdot 1\text{-}3\ H_2O$]. Two samples of metatyuyamunite from Mesa County, Colo., are not in radium-uranium equilibrium, and their Ra/U ages are 25,000 and 150,000 years. (auth)

7672

SURFACE ADSORPTION OF Cs^{137} IONS ON QUARTZ CRYSTALS. Stephen Antkiw, Hugh Waesche, and F. E. Senftle (U. S. Geological Survey, Washington 25, D. C.). Am. Mineralogist 41, 363-6(1956) March-April.

A preliminary investigation was made of the adsorption of radioactive Cs^{137} ions on large quartz crystal faces from a solution of $Cs^{137}Cl$ to determine the relation between imperfections in quartz crystals caused by variations in crystal structure or in growth patterns and adsorption of ions on the crystal structure. (auth)

7673

URANIUM-BEARING NICKEL–COBALT–NATIVE SILVER DEPOSITS, BLACK HAWK DISTRICT, GRANT COUNTY, NEW MEXICO. Elliot Gillerman and Donald H. Whitebread. U. S. Geol. Survey Bull. 1009-K, 1956. 32p. plus 3 illus. $0.65(GPO)

In the Black Hawk District, pre-Cambrian quartz diorite gneiss, which intrudes quartzite, schist, monsonite, and quartz monzonite, is the most widespread rock. The quartz diorite gneiss is intruded by many pre-Cambrian and younger rocks, including diorite, granite, diabase, monzonite porphyry, and andesite, and is overlain by the Upper(?) Cretaceous Beartooth quartzite. The monzonite porphyry, probably of Late Cretaceous or early Tertiary age, forms a small stock along the northwestern edge of the district and many dikes and irregular masses throughout the district. The ore deposits are in fissue veins that contain silver, nickel, cobalt, and uranium minerals. The ore minerals, which include native silver, argentite, niccolite, millerite, skutterudite, nickel skutterudite, bismuthinite, pitchblende, and sphalerite, are in a carbonate gangue in narrow, persistent veins, most of which trend northeast. Pitchblende has been identified in the Black Hawk and the Alhambra deposits and unidentified radioactive minerals were found at five other localities. The deposits that contain the radioactive minerals constitute a belt 600 to 1,500 ft wide that trends about N. 45° E. and is approximately parallel to the southeastern boundary of the monzonite porphyry stock. All the major ore deposits are in the quartz diorite gneiss close to the monzonite porphyry. The ore deposits are similar to the deposits at Great Bear Lake, Canada, and Joachimsthal, Czechoslovakia. (auth)

7674

RADIOACTIVE DEPOSITS IN NEW MEXICO. T. G. Lovering. U. S. Geol. Survey Bull. 1009-L, 1956. 79p. plus 7 illus. $0.70(GPO)

Forty-five areas of radioactivity in New Mexico had been investigated. Twenty-one areas contained visible uranium minerals and one contained thorium minerals. The occurrences were in the northwestern, north-central, central, southwestern, and southeastern parts of the State. The deposits in northwestern New Mexico seem to be the most promising for the mining of uranium ore. Many types of radioactive deposits have been found in north-central New Mexico. This region contains 4 radioactive copper deposits, in sandstones, 3 radioactive lignites or black shales, 2 radioactive spring deposits, and a uranium- and thorium-bearing pegmatite district. In central New Mexico only two deposits, one in the San Acacia or San Lorenzo district in Socorro County and the other in the Scholle district in Torrance County, had been reported. The radioactive deposits of southwestern New Mexico include the White Signal and Black Hawk districts in Grant County and the Terry prospect in Sierra County. In many of the Lea County oil-fields of southeastern New Mexico the brines, which are associated with oil from Permian strata, are radioactive; however, the uranium content of these brines is extremely low, and it seems unlikely that they will ever become a commercial source of uranium. The only commercial deposits of uranium ore in New Mexico, known before 1952, are in the northwestern part of the State. A plant has been constructed near Grants, in Valencia County, to process this ore. The southwestern region also has several promising uranium deposits and additional exploration may prove they contain valuable reserves of uranium ore. The few tons of ore available on the Merry Widow claim in the White Signal district and the presence of pitchblende at Black Hawk suggest that further exploration here may discover important ore reserves. Information available on the rest of New Mexico does not indicate the presence of any important sources of uranium ore under market conditions prevailing at the end of 1951. (auth)

7675

GEOLOGY OF THE DAVIS MESA QUADRANGLE, COLORADO. GEOLOGIC QUADRANGLE MAP GQ-71. Fred W. Cater, Jr. Washington, U. S. Geological Survey, 1955.

7676

GEOLOGY OF THE PARADOX QUADRANGLE, COLORADO. GEOLOGIC QUADRANGLE MAP GQ-72. C. F. Withington. Washington, U. S. Geological Survey, 1955.

7677
GEOLOGY OF THE ANDERSON MESA QUADRANGLE, COLORADO. GEOLOGIC QUADRANGLE MAP GQ-77. Fred W. Cater, Jr. Washington U. S. Geological Survey, 1955.

A study, covering the principal carnolite producing ores in southwestern Colorado, included detailed examination of mines and geologic mapping of 18 quadrangles of which Anderson Mesa Quadrangle is one. Descriptions of geologic formations and general descriptions of regional structural setting, geologic history, and ore-deposits are presented. (J.E.D.)

7678
PHOTOGEOLOGIC MAP OF THE ELK RIDGE-9 QUADRANGLE, SAN JUAN COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-127. C. F. Miller. Washington, U. S. Geological Survey, 1956. $0.50.

7679
PHOTOGEOLOGIC MAP OF THE MOAB-15 QUADRANGLE, GRAND COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-128. V. H. Sable. Washington, U. S. Geological Survey, 1956. $0.50.

7680
PHOTOGEOLOGIC MAP OF THE SPRINGDALE SE QUADRANGLE, KANE COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-131. C. L. Pillmore. Washington, U. S. Geological Survey, 1956. $0.50.

7681
PHOTOGEOLOGIC MAP OF THE SPRINGDALE SW QUADRANGLE, KANE AND WASHINGTON COUNTIES, UTAH AND MOHAVE COUNTY, ARIZONA. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-132. C. L. Pillmore. Washington, U. S. Geological Survey, 1956. $0.50.

7682
PHOTOGEOLOGIC MAP OF THE KAIPAROWITS PEAK-2 QUADRANGLE, GARFIELD COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-135. J. S. Detterman. Washington, U. S. Geological Survey, 1956. $0.50.

7683
PHOTOGEOLOGIC MAP OF THE KANAB SW QUADRANGLE, KANE COUNTY, UTAH AND MOHAVE COUNTY, ARIZONA. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-138. C. L. Pillmore. Washington, U. S. Geological Survey, 1956. $0.50.

7684
PHOTOGEOLOGIC MAP OF THE SHORT CREEK NW QUADRANGLE, MOHAVE COUNTY, ARIZONA. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-141. C. H. Marshall and C. L. Pillmore. Washington, U. S. Geological Survey, 1956. $0.50.

7685
PHOTOGEOLOGIC MAP OF THE SHORT CREEK NE QUADRANGLE, MOHAVE COUNTY, ARIZONA. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-142. C. L. Pillmore. Washington, U. S. Geological Survey, 1956. $0.50.

7686
FIXATION OF URANIUM IN THE OXIDIZED BASE METAL ORES OF THE GOODSPRINGS DISTRICT, CLARK CO., NEVADA. Paul B. Barton, Jr. (Columbia Univ., New York). 178-91(1956) Mar.-Apr.

Many of the mines of the Goodsprings District exhibit anomolous radioactivity attributable to uranium and its decay products. Most commonly the radioactivity is localized by limonite, hydrozincite, ferruginous chert and chrysocolla. Secondary uranium minerals are rare and no primary uranium minerals were identified. The radioactivity from those materials that are free from visible uranium minerals is attributed to uranium adsorbed from solution by colloidal substances during the oxidation of pitchblende-bearing primary sulfide ore bodies. Laboratory studies show that uranyl carbonate, uranyl hydroxide and uranyl ions are adsorbed by colloidal hydrous ferric oxide or basic zinc carbonate. Upon crystallization of the adsorbent, the uranium is either returned to solution or forms discrete uranium minerals within the former adsorbent. (auth)

METALS AND METALLURGY

7687 A-2215(WEC)
Westinghouse Electric Corp. Aviation Gas Turbine Div., Kansas City, Mo.
DEVELOPMENT OF NIOBIUM BASE ALLOYS. Quarterly Report No. 2 [for] March 15, 1956–June 15, 1956. R. T. Begley. July 1956. 17p. Contract AF33-(616)-3316.

Apparatus for the preparation of high-purity Nb by thermal decomposition of the pentachloride has been set up, and production of very pure material is expected during the next quarterly period. Emphasis on the analytical work was directed toward the analysis of Ti, Ta, and N_2 in Nb. Liquid extraction followed by spectrophotometric determination using pyrogallol was the method selected for the analysis of Ta in niobium. A colorimetric method for the analysis of Ti has been developed which has a lower limit of about 0.01% Ti. Both the Kjeldahl and the sodium hydroxide fusion techniques for the determination of N in Nb have given good results. A number of Nb–Fe and Nb–Cr alloys have been melted. The quality of the Nb used was rather poor, and high purity material is being prepared for subsequent studies. Two vacuum sintered ingots have been received for baseline data determinations. Preliminary rolling and recrystallization experiments have been initiated. (auth)

7688 AD-41920
Battelle Memorial Inst., Columbus.
INVESTIGATION OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS MADE BY POWDER-METALLURGY TECHNIQUES. Progress Report No. 16 for the Period April 1, 1954 to June 30, 1954. W. L. Bruckart, C. M. Craighead, W. D. Klopp, and R. I. Jaffee. June 30, 1954. 25p. Project G-1494. Contract AF 33(038)-12641.

The effects of oxide additions to Mo was studied. Emphasis was placed on the effects on creep rupture and recrystallization. Thirty-two specimens were tested at 1800°F under a stress of 25,000 psi. Outstanding among these compositions were those containing TiO_2, ZrO_2, and Cr_2O_3. Data are tabulated and presented graphically. (C.H.)

7689 AD-43492
Illinois. Univ., Urbana.
THE EFFECT OF CERAMIC COATINGS ON THE STRESS RUPTURE CHARACTERISTICS OF STAINLESS STEEL TYPE 321. Report No. 69. Dwight G. Bennett and W. J. Plankenhorn. Sept. 1954. 15p. Contract AF33(616)-2307, Final Report.

This report describes the testing of type 321 stainless steel specimens, with and without ceramic coatings, to determine the effect of the coatings on the 100-hr stress rupture strength at 1400 and 1600°F. Radiation reflective coatings were found to improve the strength somewhat because of their insulating properties. Radiation absorptive coatings reduced the strength to a slight extent. (auth)

7690 AD-46152
Illinois. Univ., Urbana.
EFFECT OF CERAMIC COATINGS ON THE FATIGUE STRENGTH OF TYPE 321 STAINLESS STEEL. Final Report. (Report No. 70). W. J. Plankenhorn and Dwight G. Bennett. Sept. 1954. 22p. Contract AF33(616)-2307.

A description is presented of the testing of type-321 stainless steel, with and without ceramic coatings, to deter-

mine the effect of coatings on the endurance limit or fatigue strength at room temperature both before and after subjection to a temperature of 1600°F for periods of 50 and 100 hr. In every case the ceramic-coated specimens proved to be more resistant to fatigue failure than similarly treated specimens of the metal alone. (auth)

7691 AD-82434

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

SOME STRUCTURES AND PROPERTIES OF CHROMIUM–NICKEL–NITROGEN TERNARY ALLOYS. E. P. Abrahamson, II, and N. J. Grant. June 1955. 27p. Contract NOas-55-318-c.

The rate of lamellar precipitation in various chromium–nickel–nitrogen alloys was investigated at 1200, 1600, and 1800°F. The effect of cold work upon the formation of the lamellar structure was also noted. Hardness values were measured in alloys containing from zero to 4.5% nitrogen at 1470, 2100, and 2280°F. The room temperature tensile properties and 1600°F stress-rupture properties of both simple chromium–nickel–nitrogen alloys and alloys containing significant amounts of carbon and silicon were investigated. The cold forgeability of the simple alloys was noted and room temperature tensile tests and stress rupture tests at 1300 and 1600°F were performed on several cold worked specimens. (auth)

7692 AD-83344

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

THERMAL STRESSES DURING WELDING. Part One of Three Part Final Report. Francis Schmerber, Richard Palme, Harry Udin, and John Wulff. May 16, 1955. 75p. DIC Project No. 7141. Contract DA-19-020-ORD-2957.

A mathematical solution of the thermal stress distribution in a centrally torch-heated mild steel disk was obtained through the use of the finite difference approximation method. Both the heating and cooling cycles were considered, and residual stresses were determined by superposition of these two processes. The resulting residual stress pattern was checked by x rays using the double exposure techniques. The experimental determination of these stresses during the welding process was undertaken. High-temperature strain gages were applied to the centrally heated disk. The temperatures on the gages were determined and showed 1) too little reproducibility from gage to gage and 2) too high variation in amplitude, compared with the small strain effect, to permit interpretation of the recorded data in terms of strains. (auth)

7693 AECU-3270

Illinois. Univ., Urbana.

LOW TEMPERATURE RELEASE OF STORED ENERGY IN COLD WORKED COPPER (thesis). Technical Report No. 8. James W. Henderson. May 1956. 40p. Contract AT-11-1-182. $6.30(ph OTS); $3.00(mf OTS).

Pure polycrystalline copper and alpha-brass specimens were deformed in compression at temperatures near −185°C. The release of stored energy was observed during subsequent warmups to room temperature and above. The annealing spectrum of pure copper shows prominent peaks at −25 and −90°C, and smaller resolvable peaks at lower temperatures. The total energy release was about 0.17 cal/gm for a specimen strained to 0.65. In contrast to pure copper, the spectrum for brass shows only one clearly resolvable peak at −10°C and extends to higher temperatures. The energy release was almost three times that of pure copper for comparable strains. The sensitivity of the experimental method is about 10^{-4} cal/gm/°C, and the results are believed to be accurate to about 10%. The apparatus was calibrated by measuring the known heat-of-fusion of mercury. (auth)

7694 AECU-3271

Utah. Univ., Salt Lake City. Inst. for the Study of Rate Processes.

PART I. THE KINETICS OF THE CORROSION OF LOW HAFNIUM ZIRCONIUM IN SULFURIC ACID SOLUTIONS. PART II. SURFACE AREA DETERMINATIONS OF ZIRCONIUM PLATES. Technical Report No. XXIV. Tennyson Smith and George Richard Hill. June 1, 1956. 6p. Project No. 1. Contract AT(11-1)-82. $10.80(ph OTS); $3.90(mf OTS).

The rate of dissolution of Zr in H_2SO_4 solutions was studied. In H_2SO_4 solutions the rate is slower than in HCl by a factor of approximately 10^4. The activation energy for the slow step is about 7 or 8 kcal/mole. The gaseous product of the reaction is H. The reaction rate is first order with respect to H_2SO_4 (free acid), and is independent of any other species in solution. It is postulated that the slow step consists of H_2SO_4 (free acid) diffusion to the Zr metal surface through a protective oxide film, probably at cracks or dislocations in the film. The applicability of measuring true surface areas or noting changes in the true surface area of Zr metal plates by measuring the capacitance of the Zr surface in aqueous solutions was studied. The capacitance of a Hg surface in H_2SO_4 solutions was measured using various initial voltages. The measurements on Hg correlated well with those given in the literature. Capacitance measurements on Zr showed that changes in the true surface area can be measured if conditions are such that the zirconium oxide film does not change. It is shown that by measuring the oxide film thickness by an optical method, true surface areas can be determined. (auth)

7695 AERE-Inf/Bib-102

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

METALLURGICAL ASPECTS OF ATOMIC ENERGY: A SELECTED READING LIST. G. L. Cooper. Apr. 1956. 15p.

7696 AERE-X/R-1806

Cambridge [Univ.], England.

INTERACTIONS BETWEEN SOLID AND LIQUID METALS AND ALLOYS. V. W. Eldred. 1953. 242p.

This report was written in the early part of 1953 and was based on work carried out at Cambridge in the preceding three years.

A technique for carrying out long-term corrosion tests is described. It has been applied to the investigation of over forty systems involving pure metals in contact with liquid Bi, Cd, Pb, Hg, K, Na, Sn and Zn at temperatures up to 550°C for periods of contact up to 300 hr. A series of ferrous and non-ferrous alloys has also been investigated under similar conditions in contact with the same liquid metals. The types of attack observed are described and discussed. Criteria for the classification of combinations of solid and liquid metals and alloys according to their corrosive behavior are put forward and applied to the systems investigated. The factors controlling the rate of solution of a solid metal in a liquid metal under various conditions are discussed theoretically in the light of the experimental results. The knowledge at present available with regard to metals and alloys manifesting a high corrosion resistance to liquid metals is considered and the characteristics of such systems are discussed. A method of predicting further systems of a similar character is suggested. (auth)

7697 AML-NAM-AE-4108.6(Pt.V)

Naval Air Experimental Station. Aeronautical Materials Lab., Philadelphia.

FATIGUE AND IMPACT EVALUATION OF MODIFIED MST 3% AL-5% CR TITANIUM ALLOY. Progress Report

for Feb. 10, 1953 to Aug. 26, 1954. Anthony E. Cerbara. Oct. 11, 1954. 25p. (AD-52379).

The fatigue strength of modified MST 3% Al–5% Cr Titanium Alloy at room temperature and 500°F was determined, as well as the impact properties for this alloy at temperatures ranging from –100 to 1400°F. The scatter of fatigue data and the indicated fatigue strengths for the modified alloy show little or no improvement over the original alloy. The impact properties of the alloy tested show greater energy absorption above 1100°F than did the material previously evaluated. Below 1100°F, there was very little change. Metallographic studies of this alloy revealed a heterogeneous structure with some defects present. (auth)

7698 BMI-1101

Battelle Memorial Inst., Columbus, Ohio.

STUDY OF BONDING FUNDAMENTALS. Horace R. Ogden, James E. Reynolds, James B. Melehan, and Robert I. Jaffee. June 27, 1956. 34p. Contract W-7405-eng-92. $0.30(OTS).

This study of solid-state bonding is concerned with bonding between single asperities and flat surfaces as well as bonding between flats, where the mating variable must be considered. Techniques and equipment developed for bonding and measuring bond strengths of single-asperity bonds are described. Preliminary results indicate that the growth of bonded areas may follow a rate equation. The electron microscope appears to be a valuable tool to study the bonding process in massive bonding. (auth)

7699 CAL-KB-836-M-8

Cornell Aeronautical Lab., Buffalo.

COMPRESSIVE-STRESS-RUPTURE PROPERTIES OF HIGH TEMPERATURE MATERIALS. Quarterly Progress Report for the Period July 15, 1954 to October 15, 1954. L. A. Yerkovich and G. J. Guarnieri. 15p. Project No. 52-670A-270. Contract AF 33(616)-245. (AD-49615).

Preliminary results are presented from an investigation of the creep characteristics of high-temperature alloy and cermet materials and an evaluation of their creep deformation behaviors under compression loads in the temperature range of 1350 to 1800°F. This report summarizes the creep and total deformation data obtained under various selected static compression stresses for wrought S-616 and Nimonic 90 at 1350°F and the metal-ceramic Metamic LT-1 at 1600°F. Curves relating time to total deformation and stress to time for various amounts of creep and total deformation are included to illustrate the creep behavior of these materials. In addition, tension-creep results obtained on the same lot of wrought S-816 bar alloy at 1350°F are presented for comparison with the corresponding compression-creep data. (For preceding period see CAL-KB-836-M-7.) (auth)

7700 EES-040038E

Naval Engineering Experiment Station. Metallurgical Lab., Annapolis.

INVESTIGATION OF EFFECTS OF COLD ROLLED THREADS ON HIGH TEMPERATURE Cr–Mo STEEL BOLTS. W. Lee Williams. Jan. 8, 1955. 21p.

Room temperature tension tests and elevated temperature creep-relaxation tests were performed on Cr–Mo steel bolt studs to compare the effects of cut threads and cold rolled threads. The thread rolling produced a significant reduction in proof stress which could largely be recovered by stress relief. The yield strength was not similarly affected, at least to any large extent. The relaxation properties were independent of the threading procedure and of the stress relief treatment used to improve the proof stress. The results indicated that the yield strength had greater utility than the proof test for specification acceptance testing. (auth)

7701 ER-6671

Martin (Glenn L.) Co., Baltimore.

DEVELOPMENT OF BRAZED SANDWICH CONSTRUCTION MATERIAL FOR HIGH-TEMPERATURE APPLICATIONS. Summary Report [for] July 1, 1954 to Oct. 30, 1955. Oct. 31, 1955. 82p. Project Title: METALLIC MATERIALS. Task Title: WELDING, BRAZING AND SOLDERING OF METAL. Contract AF 33(616)-2602.

The development of procedures for brazing honeycomb cores to stainless steel skins to form sandwich material suitable for elevated temperature applications is reported. After a preliminary investigation, 17-7PH stainless steel skin and core material and Coast Metals No. 53 brazing alloy were selected for the process development work. Several brazing methods were studied and muffle brazing in an inert atmosphere was selected for the production of two-by-two foot panels. The protected-core-container method was also developed and its feasibility demonstrated on a two-by-two foot panel. During the course of the investigation, flexure testing and metallographic examinations were used for general screening and evaluation of the methods, heat treatments, and brazing variables. (auth)

7702 ERI-2110-4-P

Michigan. Univ., Ann Arbor. Engineering Research Inst.

AN INVESTIGATION OF INTERGRANULAR OXIDATION IN STAINLESS STEEL. Quarterly Progress Report No. 5. M. J. Sinnott, C. A. Siebert, R. E. Keith, and L. H. DeSmyter. Oct. 1954. 40p. Project No. 54-670-60. Contract AF-33(616)-353. (AD-46901).

An investigation was made to determine the effect of temperatures from 1600 to 2000°F on intergranular oxidation and the nature of the penetrating material in the areas of intergranular attack, examine the effects of alloy composition on intergranular oxidation, and devise methods of reducing or eliminating intergranular penetration. The materials studied were Chromel alloy (ARM, heats A and B), Chromel alloy D, the type 310 stainless steels used in previous work, vacuum-melted type 310 stainless steel, and Inconel. A technique was developed for examining the subsurface region of oxidized specimens by means of reflection electron diffraction. The electron diffraction results showed that the same phases exist in the grain boundary fissures as were observed in the external scales. In heats 64177 and 64270, the spinel phase was especially prominent in type 309 plus Nb alloy with a high Mn content. The intergranular material appeared to be identical to the material in the external scale and in general, was simply an inward extension of the external scale. The metallographic appearances are shown for specimen surfaces after successive etching treatments. Data are presented on alloys subjected to stressed and to unstressed oxidation. (auth)

7703 HW-43056

[Hanford Atomic Products Operation, Richland, Wash.]

ON THE MECHANICAL PROPERTIES OF ZIRCALOY-3b. Dale E. Johnson. May 11, 1956. 25p. Contract [W-31-109-Eng-52]. $4.80(ph OTS); $2.70(mf OTS).

The tensile properties of Zircaloy-3b were determined as a function of the cold-worked condition of the material between the limits of 0 and 80% cold work at test temperatures of –50°C, 22°C, 100°C, 200°C and 300°C. Cold working did not increase the tensile strength. The ductility was inferior to Zircaloy-2. (F.S.)

7704 ISC-708

Ames Lab., Ames, Iowa.

SEMI-ANNUAL SUMMARY RESEARCH REPORT IN METALLURGY FOR JULY–DECEMBER, 1955. May 29, 1956. 37p. Contract W-7405-eng-82. $0.30(OTS).

Niobium and Ta were separated effectively by both HF and NaOH. Citric and tartaric acids were explored un-

successfully for Hf and Zr separation and enrichment. Thorium was chlorinated, and tetrachloride was formed and the reaction of anhydrous HF with trivalent oxides prepared trifluorides of La, Gd, Er, Dy, Nd, and Y. The iodide process prepared V metal, Nb metal was prepared by the reduction of Nb_2O_5 and Th was prepared by the reduction of ThF_4. Phase studies were made on U–Zn, Th–Zn, Hf–Th, Zr–Ta, Zr–Zn, Ta–V, V–Cu, Ta–V alloys. Corrosion studies were conducted on Ta, V, U, and Ta carbides. The kinetics and mechanism of the α, β, and γ transformations in U were investigated. (For preceding period see ISC-644.) (F.S.)

7705 MAB-106-M

National Research Council. Materials Advisory Board.
PRECISION STEEL CASTINGS FOR AIRCRAFT USE. Apr. 20, 1956. 59p. Contract DA-49-025-sc-83.

Present activities are insufficient and uncoordinated in the wider use of precision steel castings in aircraft. Basic investigations in foundry controls, mold materials and techniques, alloy casting and quality standards should be continued. (F.S.)

7706 MD-195 and MD-196

Canada. Dept. of Mines and Technical Surveys. Mines Branch.
THE INVESTIGATION OF THE COMPOSITION OF CERTAIN TITANIUM-BEARING ELECTROLYTIC PRODUCTS OBTAINED AT LAVAL UNIVERSITY IN CONNECTION WITH D.R.B. RESEARCH PROJECT NO. 407. PART I. Norman F. H. Bright and Richard H. Lake. PART II. Norman F. H. Bright, John F. Rowland, and Richard H. Lake. (Pt. I (MD-195), Jan. 24, 1956. 43p.; and Pt. II (Md-196), Feb. 9, 1956. 29p.).

These two reports were issued separately but are cataloged as a unit.

Results of the examination by x-ray and chemical means, of additional titanium-bearing electrolytic products obtained at Laval University are given. The presence of the compound, K_2NaTiF_6, has been confirmed in many products formed both with and without the use of electrolysis. An appendix gives details of work done on a crystalline product which is considered to be probably $CaO \cdot Ti_2O_3$, a new compound in the Ca–Ti–O system. (auth)

7707 NAA-AL-2151

North American Aviation, Inc., Downey, Calif.
CREEP BUCKLING OF COLUMNS. [Period covered] October 1952 through October 1954. R. J. Benjamin. July 5, 1955. 54p. Guided Missile Project MX-770. Contract AF33-600-28469. (AD-74762).

There is established a general analytical basis for determining the period of time for which a column of arbitrary cross section, constant along the column length, can sustain a given constant load before collapse. Based upon certain engineering hypotheses as to the creep behavior of a material subjected to a time-varying stress and postulating that the deflected shape of the column is at all times sinusoidal, the mathematical analysis is shown to lead to an integro- partial differential equation relating an inelastic strain parameter to a time parameter. The collapse time of the column is then defined as that time at which the inelastic strain parameter tends to increase without bound at any point of the column cross section. Because of the complexity of the differential equation, it was not possible to obtain an analytical solution. Numerical integration methods could be conveniently employed, however, and numerous solutions were obtained in this manner using an electronic digital computer (the IBM Type 701 machine). Material constants were typical of those for 24S-T3 aluminum alloy in compression at 500°F. The results of these computations are presented in such a fashion as to illustrate the effect upon the column collapse time of varying the column slenderness ratio, applied load, initial deflection, cross sectional shape, and form of creep law assumed to be valid for the material. It is shown that convenient design curves may be prepared from which allowable stresses to obtain specified column lifetimes may be determined directly. (Contractor's abstract)

7708 NACA-TN-3678

Carnegie Inst. of Tech., Pittsburgh.
INFLUENCE OF ALLOYING UPON GRAIN-BOUNDARY CREEP. F. N. Rhines, W. E. Bond, and M. A. Kissel. June 24, 1955. 16p.

Grain-boundary displacement, occurring in bicrystals during creep at elevated temperature (350°C), was measured as a function of the Cu content (0.1 to 3%) in a series of Al-rich Al–Cu solid-solution alloys. Because alloying effects alone were to be investigated, the conditions of observation were limited to a single temperature and range of stress. (auth)

7709 NACA-TN-3731

Langley Aeronautical Lab., Langley Field, Va.
TENSILE PROPERTIES OF INCONEL AND RS-120 TITANIUM-ALLOY SHEET UNDER RAPID-HEATING AND CONSTANT-TEMPERATURE CONDITIONS. George J. Heimerl, Ivo M. Kurg, and John E. Inge. Apr. 16, 1956. 29p.

Results are presented of rapid-heating tests to determine the tensile strength of Inconel and RS-120 titanium-alloy sheet heated to failure at uniform temperature rates from 0.2 to 100°F per second under constant load conditions. Yield and rupture stresses, obtained by rapid heating, are compared with yield and ultimate stresses from elevated-temperature tensile stress-strain tests for ½-hour exposure. The applicability of master curves and temperature-rate parameters to the prediction of yield and rupture stresses and temperatures under rapid-heating conditions was investigated. (auth)

7710 NOTS-TM-1628

Naval Ordnance Test Station, Inyokern (China Lake), Calif.
CHEMICALLY-ACTIVE LIGHT METALS: AN ANNOTATED BIBLIOGRAPHY. PART 1. Milton R. Wolfson, John C. Chang, Mary R. Zagala, and Richard D. Potter. July 5, 1954. 205p. (AD-52373).

7711 NP-5908

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM AND TITANIUM ALLOYS AND CONTROL OF HYDROGEN IN TITANIUM AND TITANIUM ALLOYS. Quarterly Progress Report No. 3. G. A. Lenning, F. R. Schwartzberg, W. M. Albrecht, M. W. Mallett, P. R. Wilson, D. N. Williams, and R. I. Jaffee. Dec. 15, 1955. 32p. Contract AF33(616)-2813.

Studies of the mechanism of hydrogen embrittlement were continued. Tensile and impact data for Ti–4 wt % Al–4 wt % Mn alloy indicated that this alloy has a lower H_2 tolerance in the acicular α-β condition than in the equiaxed condition. Oxide film thickness and thermal history had a measurable effect on the hydrogen absorption rate. (For preceding period see NP-5858.) (C.W.H.)

7712 NP-5911

Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.
JOINING OF MOLYBDENUM. Eleventh Quarterly Report [for] July 1, 1955–November 30, 1955. Research Report 71F089-R7. W. N. Platte. Jan. 11, 1956. 20p.

Use of diffusion techniques as a means of removing nitrogen from the weld zone was attempted with qualitative success. However, further work will be required for exact

determinations. Weld crater cracking has been found to be caused by residual welding thermal stresses which approach the fracture strength of the material. Preliminary work on heat treatment and polygonization of weld metal is discussed. Work with non-metallic additions in an attempt to reduce weld grain size is mentioned. Improvement in sintered titanium deoxidized molybdenum is also described. (auth)

7713 NP-5916

Thompson Products, Inc., Cleveland.

FINAL REPORT ON THE STUDY OF THERMENOL AS A COMPRESSOR BLADE MATERIAL. J. C. Sawyer and E. G. Pekarek. Oct. 31, 1955. 45p. Contract NOa(s) 51-1257-c.

Thermenol, an aluminum–iron–molybdenum alloy, was evaluated as a jet engine compressor blade material. Ingots formed by the vacuum melting technique were converted to bar stock by forging and rolling. Physical properties were investigated and found to be consistent with requirements for compressor blade material. (F.S.)

7714 NP-5919

California Inst. of Tech., Pasadena. Dynamic Properties Lab.

SOME HIGH TEMPERATURE OXIDATION CHARACTERISTICS OF NICKEL WITH CHROMIUM ADDITIONS. Technical Report No. 7. Gordon Everett Zima. Apr. 1956. 99p. Project No. NR 031-355. Contract N6onr-24430.

The relationship between alloy chromium content and oxidation rate has been determined for Ni–Cr alloys containing up to 17 at.% Cr. The tests were conducted at 1096°C, under one atmosphere of oxygen. The observed structural and phase changes in the oxide were related to the oxidation rate. It has been found that increasing amounts of Cr in the NiO phase govern the oxidation rate for alloys containing less than 2 at.% Cr. For alloys of greater than 2 at.% Cr, a complex exchange of Cr among three phases—NiO, Cr_2O_3 and the spinel, $NiCr_2O_4$—has been detected. This Cr exchange was reflected in the lattice parameter of the NiO phase, and in the rate of increase of oxidation rate with Cr addition to the alloy. The present work indicates that an interstitial diffusion mechanism may become dominant in the oxides of high Cr content. Within the scope of the present work, the high oxidation stability of Ni–Cr alloys has been correlated with the presence of Cr_2O_3 in the oxide layer. Oxidation rates for high-purity Ni have been determined at temperatures of 980, 1096, and 1260°C, under one atmosphere of oxygen. The present data, combined with lower temperature data obtained by Gulbransen and Andrew, yielded an activation energy of 45.1 kcal/mole for the oxidation of Ni. (auth)

7715 NRL-4713

Naval Research Lab. Metallurgy Div., Washington, D. C.

NOTCH DUCTILITY OF COMMERCIAL MALLEABLE IRONS. Final Report. H. F. Bishop, G. A. Sandoz, N. C. Howells, and W. S. Pellini. Mar. 20, 1956. Project Nos. NR 642-030 and NS 014-100.

The effect of temperature on the notch ductility of commercial malleable irons was investigated for conditions entailing the presence of ultra-sharp notches. The drop-weight test was used to establish the nil ductility transition temperature and the explosion crack-starter test was utilized to establish the relative level of resistance to fracture initiation and propagation at temperatures above the nil ductility transition. Charpy V tests were conducted to determine the general significance of the low-level transition curves of this material. The nil ductility transition (NDT) temperatures of normal ferritic irons are generally lower (brittle fracture resisted to lower temperatures) than those of other ferrous materials in the same strength class. The presence of carbide and primary flake structures impairs the notch ductility properties of the ferritic irons. The NDT temperatures of the pearlitic irons are higher than those of the ferritic materials and are affected by hardness, method of heat treatment, and phosphorus content. The explosion tests demonstrated that the change from nil ductility to complete resistance to brittle fracture (ductile, shear fracture only) occurs over the temperature range indicated by the Charpy V transition curve. The low levels of the energy values at the upper shelf of the Charpy V transition curve indicate that the material is subject to ductile fracture with relatively low energy absorption. (auth)

7716 NRL-4718

Naval Research Lab. Metallurgy Div., Washington, D. C.

NOTCH DUCTILITY OF AUSTENITIC NODULAR IRONS. Final Report. R. E. Morey and H. F. Bishop. Mar. 6, 1956. 22p. Project Nos. NR 642-030 and NS 013-124.

The notch ductility characteristics of two types of austenitic nodular irons were investigated by means of the drop-weight test. Irons containing less than 0.6% chromium (Class B) have extremely low nil ductility transition temperatures and are recommended for low temperature application involving severe service conditions. The irons containing 1.6 to 2.25% chromium (Class A) were found to have erratic notch ductility characteristics, with NDT temperatures varying from −140 to above 200°F. The notch ductility characteristic of the Class A irons are impaired by increasing section size, phosphorus content, and the presence of carbide structures. The Class A material demonstrates very low energy absorption in ductile tearing. (auth)

7717 NYO-7492

Aeroprojects, Inc., West Chester, Penna.

INVESTIGATION OF GRAIN REFINEMENT IN BERYLLIUM INGOTS RESULTING FROM THE APPLICATION OF ELASTIC VIBRATORY ENERGY DURING COOLING AND SOLIDIFICATION. Progress Report No. 1 Covering Period from July 1 to August 31, 1955. 10p. Contract AT(30-1)-1836. $1.80(ph OTS); $1.80(mf OTS).

For the initial work in the investigation of the grain-refining effect of ultrasonic treatment on Be, study has been made of factors relevant to the problem. Preliminary design has been prepared for an induction-heated furnace which will permit elastic vibratory energy application during the cooling and solidification of small cylindrical ingots. (auth)

7718 NYO-7494

Aeroproject, Inc., West Chester, Penna.

INVESTIGATION OF GRAIN REFINEMENT IN BERYLLIUM INGOTS RESULTING FROM THE APPLICATION OF ELASTIC VIBRATORY ENERGY DURING COOLING AND SOLIDIFICATION. Progress Report No. 3 Covering Period from November 1 to December 31, 1955. Jan. 1956. 12p. Contract AT(30-1)-1836. $1.80(ph OTS); $1.80(mf OTS).

The beryllium melt furnace was assembled and tested with melts of Fe, Cu, and Ni. An optical pyrometer was selected as the means for recording melt temperatures, since its readings correlated with thermocouple "power-off" measurements and were more readily taken. It was determined that a 18 kw induction heating unit generates sufficient power for melting Be within a reasonable time. Provisions for controlling melt cooling were checked by observing the migration of the solid-liquid interface. Investigation of candidate coupler materials for solubility in molten Be was conducted and preliminary data indicate that W is attacked slightly less than Mo and Mo less than Ta. The unavailability of W in $1\frac{1}{4}$-in. diameter rod form may make it necessary to use Mo as the coupler material on this program. (auth)

7719 NYO-7496
Aeroprojects, Inc., West Chester, Penna.
INVESTIGATION OF GRAIN REFINEMENT IN BERYLLIUM INGOTS RESULTING FROM THE APPLICATION OF ELASTIC VIBRATORY ENERGY DURING COOLING AND SOLIDIFICATION. Progress Report No. 5 Covering Period from March 1, to April 30, 1956. May 1956. 21p. Contract AT(30-1)-1836. $3.30(ph OTS); $2.40(mf OTS).

Initial experiments were made in the ultrasonic treatment of beryllium melts during cooling and solidification, utilizing three ultrasonic frequencies (20 kc, 75 kc, and 300 kc) and two power levels, and time-temperature data were plotted. Sufficient data are not yet available to determine the power levels and/or frequencies at which maximum dispersion of the molybdenum coupler into the molten beryllium occurs. For the tests thus far conducted, the amount of molybdenum dispersed into an average melt of 202.3 grams varied from approximately 5 grams to as high as 40 grams. (auth)

7720 RAE-TN-MET-201
Gt. Brit. Royal Aircraft Establishment, Farnborough, Hants, England.
ALLOYS OF TITANIUM WITH IRON. D. A. Sutcliffe. July 1954. 15p. (AD-50234).

Binary titanium iron alloys containing up to 9.18% iron by weight have been prepared by arc melting. Tensile, hardness and impact tests have been made on the alloys at room temperature. The results show that additions of iron cause a steady increase in hardness and strength with a corresponding loss in ductility. An alloy containing 3.0% iron had a Vickers hardness of 242 D.P.N.; a U.T.S. of 45.6 tons/sq inch and a percent elongation of 24: the impact strength as determined on Izod specimens of substandard size was 3.7 ft lbs (approximately half that of the basis titanium). A survey of the literature is included and details are given of the published work on the titanium–iron phase diagram and the effect of iron on the mechanical properties of titanium. (auth)

7721 RPL-3
Watertown Arsenal. Rodman Process Lab., Mass.
PRODUCTION ENGINEERING MEASURES; A LITERATURE SURVEY ON ALUMINUM OXIDE BASE CUTTING TOOLS. F. S. Delacey. Aug. 31, 1954. 18p. (AD-53633).

A literature survey was conducted to review data concerning the fabrication and utilization of Al_2O_3 as a cutting tool material. The historical background, technological development, properties, and application of cutting tools fabricated from Al_2O_3 are discussed. The composition, specific gravity, and mechanical and thermal properties of representative materials are listed. Al_2O_3-base cutting tools are being produced on a limited scale. Al_2O_3-base material is available which compares favorably with the standard metallic tool compositions in hardness, high-temperature, and wear-resistant properties. The low-temperature tensile strength, ductility, and thermal shock resistance of ceramic materials are inferior to those of the metallic tool materials. (auth)

7722 TML-39
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
SURVEY OF PHYSICAL-PROPERTY DATA FOR TITANIUM AND TITANIUM ALLOYS. H. W. Deem and C. F. Lucks. Mar. 30, 1956. 36p. Contract AF 18(600)-1375.

A literature survey was made in the TML and other Battelle libraries for titanium and titanium alloys. Data were found and reported for eighteen properties of electric, magnetic, optical, sound, thermal, and general physical properties. (F.S.)

7723 TML-48
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
THE ENGINEERING PROPERTIES OF PRECIPITATION-HARDENABLE STAINLESS STEELS. D. B. Roach and A. M. Hall. July 20, 1956. 91p. Contract AF18(600)-1375.

The mechanical and physical properties, as well as the engineering and production characteristics, of the four principal age-hardening stainless steels are reported. These steels carry the trade designation 17-7PH, 17-4PH, Stainless W, and AM 350. The data reported were supplied by the producers. Included are compositions, production practice, heat treatment, engineering properties, availability, forming characteristics, and information on brazing and welding. (auth)

7724 WADC-TN-55-372
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
A SURVEY OF THE LITERATURE ON THE LUBRICATION OF TITANIUM. Robert J. Benzing and Ray E. Bryant. Aug. 1955. 20p. Project and Task title: LUBRICATION MECHANICAL EVALUATION.

A survey of the literature on the lubrication of titanium was made. The work studied is broken down into three main groups: frictional and lubricating properties, surface coatings and treatments, and machining practice. A brief discussion summarizing the literature is given which outlines the present status of the work with suggestions for future practices. (auth)

7725 WADC-TR-53-162(Pt.2)
Missouri School of Mines and Metallurgy, Rolla.
ELECTRODEPOSITION OT TITANIUM. Albert W. Schlechten, Martin E. Straumanis, and C. Burroughs Gill. Nov. 1954. 57p. Project title: FINISHES AND MATERIALS PRESERVATION. Task title: ELECTRODEPOSITION AND ELECTROCHEMICAL TREATMENTS. Contract AF33(616)-75. (AD-58599).

A process for obtaining a diffusion coating of titanium on iron, mild steel, copper, and other metals was developed. This coating is very high in titanium content and displays good corrosion resistance. Many of the variables in the process have been investigated and are reported. Data are also presented on the corrosion of titanium in fused salts, the resulting products, and the probable mechanism. (auth)

7726 WADC-TR-54-200
Minnesota. Univ., Minneapolis.
PRELIMINARY INVESTIGATION OF THE EMANATION FROM COLD-WORKED METALS. F. H. Vitovec. July 1954. 30p. Contract AF-33(038)-20840. (AD-41227).

A literature review is presented on the experimentation conducted to study the emission of electrons from metal surfaces caused by disturbances such as cold working or abrading. The Kramer effect or the emanation recorded by Geiger counters, was investigated to determine the effect of alternating stress upon the intensity of the radiation. The GE Poppy particle counter was adapted to a 2200-v output and a 10^6-to 10^9- ohm quench resistance, but the instrument was unstable. The tests performed with the instrument indicated that the rate of discharge was independent of the degree of cold working. The Russell effect of the action on photographic emulsions by freshly disturbed metallic surfaces, was also investigated. The Russell effect was probably caused by the action of H_2O_2 which is formed on the active surface of metals in the presence of O and H_2O. Other physical properties, such as electric resistance of cold-worked metals, showed a temperature dependence similar to the radiation recorded in Kramer's experiments.

The increase of free electrons caused by various treatments of the material which is recorded in Kramer's experiments most likely provided the initial stages of the Russell effect. The Russell effect provided a very sensitive test for oxidation and corrosion processes on metal surfaces. (auth)

7727 WADC-TR-54-590
Kaiser Aluminum and Chemical Corp., Spokane.
POWDER FABRICATION OF ALUMINUM ALLOYS. Report for period December 1953 to December 1954. J. B. Hess and R. S. Mateer. Sept. 1955. 27p. Project Title: METALLIC MATERIALS; Task Title: ALUMINUM ALLOYS. Contract AF 33(616)-2296.

A fabrication method, combining powder metallurgy techniques and conventional extrusion, was developed for the purpose of alloying aluminum with refractory compounds and other unusual constituents. Additions of B_4C, αAl_2O_3, TiC, SiC, ZrO_2, WC, $TiAl$, $MnAl_4$, $FeAl_3$, Mo, Cr, Si and Cu were made to a base of commercial atomized aluminum powders, and the resulting alloy properties were determined. Outstanding improvements in Young's modulus were achieved by means of the SiC and B_4C additions; however, accompanying tensile properties were only mediocre. Current attempts to improve these tensile properties by utilizing prealloyed powders as bases for the refractory additions are still in preliminary stages of study. (auth)

7728 WADC-TR-55-110
Rensselaer Polytechnic Inst., Troy, N. Y.
ALUMINUM POWDER METALLURGY. F. V. Lenel, A. B. Backensto, and M. V. Rose. June 1955. 84p. Project Title: METALLIC MATERIALS. Task Title: THE EFFECT OF COMPOSITION AND INTERNAL STRUCTURE ON THE PROPERTIES OF ALLOYS. Contract AF 33(616)-351.

Procedures used in producing aluminum powder extrusions from flake aluminum pigment powders and from atomized powders are described. From tests of powder properties and mechanical properties of the extrusions, it was found that the yield strength at room temperature and at 400°C increased directly with the square root of the reciprocal of the average flake thickness and that the weight per cent of oxide was not as important as the flake thickness in strengthening these extrusions. (auth)

7729 WADC-TR-55-160(Pt. 2)
Dow Chemical Co., Midland, Mich.
INVESTIGATION OF ALLOYS OF MAGNESIUM AND THEIR PROPERTIES. PART 2. PHYSICAL PROPERTIES OF Mg BASE ALLOYS. J. D. Wood, ed. Oct. 1955. 27p. Project Title: "METALLIC MATERIALS". Task Title: "IMPROVED MAGNESIUM ALLOYS". Contract AF-33(616)-2337, Final Report.

The coefficients of linear thermal expansion were determined for pure Mg, several Mg alloys, and for ingot and pellet extruded Mg using a high precision dilatometer. The electrical conductivities of several Mg alloys, and cast and pellet extruded specimens were determined using a Kelvin bridge. Values obtained compare favorably with previous determinations. Thermal conductivities of the alloys were calculated from the electrical conductivity data using the Powell and Bungardt equations. The heat capacity and heat fusion of pure magnesium are also reported. The effects of heat treatment, composition, mechanical history, and working direction on electrical conductivity were noted. There was no significant effect of these variables on thermal expansion. (auth)

7730 WADC-TR-55-303
General Electric Co. Research Lab., Schenectady, N. Y.
INVESTIGATIONS OF DEFORMATION AND FRACTURE OF METALS. R. P. Carreker, Jr., R. W. Guard, and R. E. Lenhart. May 1955. 25p. Project Title: METALLIC MATERIALS. Task Title: DEFORMATION MECHANISMS OF METALS. Contract AF 33(616)-2120.

The investigation of the plastic deformation behavior of pure metals as a function of temperature and grain size, and correlations of the stress, strain and strain rate have been made on a phenomenological basis for both tensile and creep tests. Conclusions that can be reached are: Even after consideration of relative mechanical strength on the basis of homologous temperature there are differences between different pure metals which can be related to differences in the character of the dislocations present and their interaction with impurity atoms; a sufficient number of exceptions have been found to the concepts of "activation energy" as proposed by Sherby, Dorn, and co-workers to indicate the need for a more critical study of this hypothesis; the present status regarding the mathematical representation of creep and tensile curves is adequate, but it is doubtful if any valid knowledge concerned with mechanisms of plastic deformation can be deduced from such mathematical expressions. Effects of dispersions on the mechanical properties of Al–Mg alloys have been investigated. It was found that the presence of particles can influence the strength by affecting the primary mode of deformation. In the case of Mg, it is shown that particles reduce the amount of twinning and change the deformation behavior in this manner. Since the primary mechanism involved is a function of the preferred orientation in the specimen, the texture resulting from fabrication must be considered in interpreting test data. (auth)

7731 WADC-TR-55-391
Southern Research Inst., Birmingham, Ala.
TENSILE, FRACTURE, AND SHORT-TIME CREEP PROPERTIES OF AIRCRAFT-STRUCTURAL MATERIALS AT VERY HIGH TEMPERATURES AFTER RAPID HEATING. J. Robert Kattus and Clifford L. Dotson. Dec. 1955. 107p. Project No. 2998. Contract AF33(616)-2837.

The tensile, fracture, and short-time creep properties of electrolytic copper sheet, ingot iron sheet, tantalum sheet, molybdenum sheet, and four types of graphite—types GBE, 3474-D, 7087, and GBH—were determined at temperatures up to the melting points of the metals and up to 5200°F for the graphite. High rates of heating were used in all tests, and the tensile tests were conducted at moderate to rapid strain rates after relatively short holding times at the test temperatures. The metals decreased in tensile strength continuously with increasing temperatures, but they did retain some strength at temperatures approaching the melting points. The graphite materials decreased little in strength between room temperature and 5200°F. The copper and iron were capable of supporting a stress of 200 psi for five minutes at temperatures near the melting points. For five minutes at temperatures between 4600 and 4800°F, each type of graphite supported a load equivalent to two-thirds of the room-temperature strength. Because of deterioration of the specimens due to oxidation, molybdenum and tantalum were not able to support a stress of 200 psi for as long as one minute at temperatures near their melting points. At maximum temperatures of 1900 and 2200°F, the molybdenum and tantalum, respectively, were capable of supporting a stress of 10,000 psi for five minutes. (auth)

7732 WADC-TR-55-458(Pt. 1)
Crane Co., Chicago.
RELAXATION BEHAVIOR OF TITANIUM ALLOYS. [Period covered] April 1954 to October 1955. Ernest A. Sticha. Feb. 1956. 39p. Project Title: METALLIC

MATERIALS. Task Title: TITANIUM METAL AND ALLOYS. Contract AF-33(616)-2400.

Relaxation resistance of three titanium alloys in the temperature range 400 to 800°F was determined to assist in evaluating possible use of titanium fasteners in aircraft for the purpose of saving weight. Tests performed showed A-110AT alloy to have the best resistance to relaxation, C-130AM alloy the next best, and the 3-Mn complex alloy the least. Differences between the alloys are greatest at 800°F and almost disappear at 400°F. All three alloys suffered some loss of impact resistance during testing at 700 and 800°F but the cause of embrittlement was not apparent in the microstructure. Heat treatment of the alpha-beta alloys and cold working of the all-alpha alloy to higher strength properties failed to improve relaxation resistance at the higher temperature levels. (auth)

7733 WADC-TR-56-114

Universal-Cyclops Steel Corp., Bridgeville, Penna. INVESTIGATION OF THE EFFECTS OF INCONGRUOUS ELEMENTS AND THE INTERACTION EFFECTS OF THESE ELEMENTS ON HIGH TEMPERATURE STRENGTH OF Fe–Co–Ni–Cr ALLOYS. Final Report [for] December 1, 1954 to February 29, 1956. Thomas L. Robertshaw and Francis M. Richmond. Apr. 1956. 61p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF33(616)-2777.

An investigation was made of the effect of various hardening elements on the high-temperature properties of vacuum-melted alloys having a base composition of 60 at. % Ni, 20 at. % Cr, 10 at. % Fe and 10 at. % Co. Stress-rupture properties of these alloys at 1600°F were largely dependent on the vacuum obtained during melting, the fabrication methods, and the total amount of hardener. On the basis of atomic misfit, the hardening elements B, Zr and Nb were equivalent to Mo in increasing the rupture strength of these alloys. On this same basis, however, Ti was more potent and Al less potent than Mo. A maximum in stress-rupture stress occurred at a hardener level of about 35 equivalent atomic percent Mo. It was found that, a higher level of strength was more likely to occur at a given hardener level when greater variety of hardening elements were added. (auth)

7734 WAL-893/154-16

Syracuse Univ., N. Y. Metallurgical Research Labs. PLASTIC FLOW AND FRACTURING OF METALS. Summary Report [for] the Period December 1952 to December 1954. K. Tong. Jan. 1955. 38p. Project 1620.235. Contract DA-30-115-ORD-376. (AD-58412).

Results are given for residual stress measurements of indentation gages and of the plastic strain distribution study made by using hardness survey and brittle lacquer coating. A preliminary study of low-temperature treatment of autofrettaged gun tubings has been made and descriptions are given of an automatic recording bend-test machine for determination of embrittlement. (auth)

7735 WAPD-SFR-Fe-291

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. TENSILE AND IMPACT TEST RESULTS ON IRRADIATED BORON–STAINLESS STEEL. Supplement to WAPD-SFR-Fe-192. J. R. Schettig. Oct. 3, 1955. 4p.

The results of tensile and impact tests on irradiated boron–stainless steels at 600°F are compared with results at room temperature. Data showed lower yield and ultimate values and the ductility is less at the elevated temperature. Fracture surfaces at 600°F were exceptionally smooth. (F.S.)

7736 AEC-tr-2507

INFLUENCING NICKEL AND TITANIUM OXIDATION VELOCITY BY ALLOYING AND BY TREATMENT WITH METALLIC OXIDE VAPOR. Harald Pfeiffer and Karl Hauffe. Translated from Z. Metallkunde 43, 364-9(1952). 14p.

Treatment with metallic oxide vapor represents (together with the use of alloys) a further possibility of influencing the scale stability of a metal. The question of the production of a metallic oxide vapor depends at times on the given conditions of pressure and temperature. An improvement in the scale stability of nickel is obtained by treatment with Li_2O and of titanium by treatment with WO_3 thus confirming theoretical predictions. Further, the possibility of influencing the growth of scale layers composed of several oxide layers by addition of foreign oxides is discussed. The results of the oxidation experiments on copper–aluminum alloys in the presence of MoO_3 vapor are discussed, and possibilities for their interpretation are suggested. (auth)

7737 AEC-tr-2531

POLAROGRAPHY OF MELTS. I. LIMITING CURRENTS IN MOLTEN ELECTROLYTES. N. G. Chovnyk. Translated from Zhur. Fiz. Khim. 30, 277-85(1956). 19p.

An electrolytic cell consisting of microplatinum (tungsten) stationary electrodes and a large silver comparison electrode with field separation by an asbestos diaphragm was suggested for polarography of melts. Examples of bivalent Sn oxidation and Co ion discharge in melts were used to show that polarograms, with clearly expressed areas of limiting currents without maximum, can be obtained automatically. Intensities on the polarograms, at which increases appear in current, correspond to the electromotive force of circuits of the investigated metals and to the difference in magnitude of decomposition intensities. (R.V.J.)

7738 AERE-Lib/Trans-671

EFFECTS OF ELECTROPOLISHING ON THE PHYSICAL CHEMICAL PROPERTIES OF THE SURFACE OF PURE ALUMINUM. P. V. Schigolev. Translated by T. Turton from Zhur. Fiz. Khim. 29, 682-4(1955). 8p.

It is established that electropolishing considerably increases the coefficient of reflection of light of the aluminium (on the average by 12 to 15%). Electromicroscopic investigation showed that the micro-relief of the surface of the electropolished aluminium is not perfect. A cellular structure appears on the surface, apparently caused by unequal melting, and as a result a new microroughness appears which may be observed on high magnification (x 18000). Electropolishing causes a considerable increase in electrical resistance of the surface of aluminium. The potential of puncturing of the film on the surface of electropolished aluminium is about 25 times higher than the potential of puncturing of the natural film formed on the surface of sheet aluminium in the process of production and further storage. On the X-radiograms of the surface of electropolished aluminium, were discovered, besides the basic lines of aluminium, new lines which apparently belong to some unknown modification of Al_2O_3. (auth)

7739 AERE-Lib/Trans-703

THE EXTRACTION OF BERYLLIUM. G. Jaeger. Translated by R. J. Richardson from Metall 4, 183-91(1950). 22p.

Analytical procedures are presented for the separation of BeO from beryl and other minerals. Electrolytic and chemical processes are described for the production of Be metal. Refining, recasting and sintering of Be metal are also discussed. (W.L.H.)

7740 AERE-Lib/Trans-711

TESTING CHIPPABILITY BY MEANS OF THE LEYEN-SETTER PENDULUM. A. Wallichs and K. Krekeler. Translated by W. G. Olscher from Arch. Eisenhüttenw. 4, 41-3(1930-31). 7p.

Testing the chippability by means of the Leyensetter pendulum of the freshly ground tool showed that the cutting edge was undamaged. The use of the tool in a lathe test employing a cutting depth of 0.2 mm and feed of 0.45 mm per revolution indicated that the time taken for the test is the time necessary to cut a chip 25 m long as measured along the line of cut. The resultant wear of the tool, by measuring the so-called back pressure height of the secondary pendulum was observed. (auth)

7741 AERE-Lib/Trans-714

THE OPTICAL INVESTIGATION OF THE DIFFUSION OF METALS INTO ONE ANOTHER. Herwig Schopper. Translated by N. Willis from Z. Physik. 143, 93-117(1955). 26p.

In the case of all previously known methods, the determination of small diffusion coefficients ($D < 10^{-13}$ cm^2/sec) is attended by a large uncertainty, as thin layers ($d < 1/u$) must be used whose thicknesses can only be determined roughly. By measurement of the absolute light phase for reflexion at the metal layers, thicknesses can be measured in a simple way down to about 40 m/u. One evaporates successively in a suitable way the metals under investigation in high vacuum on to a glass substrate, and one determines the layer thickness of the layer evaporated first and of the double layer. The total thickness can be followed continuously during the diffusion. In this way volume changes can be established, which allow conclusions to be made on the diffusion mechanism. The course of the diffusion is followed by measurement of the reflecting power. As the penetrating depth of light into metal is small (about 40 m/u), thinner layers can be used than those used, for example, for the observation of x-ray diffraction. The new method is used to measure the diffusion coefficients for the Au–Pb system between 18 and 100°C. It is proved by x-ray diffraction photographs that intermetallic compounds arise in the diffusion. (auth)

7742 AERE-Lib/Trans-720

THE DEPOSITION OF BERYLLIUM ON COPPER AND OTHER METALS BY MEANS OF FUSION ELECTROLYSIS. H. Fischer and W. Schwan. Translated by E. L. Poole from Metallwirtschaft 12, 187-9(1933). 7p.

Deposition of Be on Cu by fusion electrolysis of BeF_2/NaF mixtures at 700 to 800° produced smooth, adherent layers of an alloy containing mechanically resistant Be. Conditions under which Be was deposited were investigated with respect to the factors influencing the fusion electrolysis in a dehydrated electrolyte containing a weighed quantity of NH_4F. The relation of the amount of Be deposited on Cu and the duration of the electrolysis was studied. The adhesion of the base strongly depends on the diffusion in the base. The slower the rate of diffusion in the base the less Be was deposited in the layers. Be diffused relatively easy in the specimens investigated but very little in Be–Cu alloys with a high percentage of Be. Evidence of diffusion effects was observed by deposition of Be on other metals under otherwise identical conditions. (R.V.J.)

7743 AERE-Lib/Trans-730

REGULARITIES IN THE PROCESSES OF GROWTH OF CRYSTALS. PART 3. THEORY CONCERNING THE PRESSURE WELDING OF METALLIC BODIES. F. Erdmann-Jesnitzer and W. Wichmann. Translated by F. Hudswell from Z. Metallkunde 46, 854-9(1955). 13p.

The temperature-time relationship for the bonding of poly-crystalline aluminium has been ascertained to be an exponential law by heating two aluminium cylinders which have been cold pressed with their plane parallel faces lying close together. The welding, calculated theoretically, obeys the equation $1/t = c_e e^{-Q_v/RT}$. A definite amount of energy is required for bonding (cladding, sintering, pressure welding) and is composed of the energy of deformation and (or) heat energy. When extrapolated to $t \to 0$, the experimental results permit an interpretation of cold-pressure welding in terms of "quasi-liquid" surface layers when shock-like deformation takes place. (auth)

7744 RAE-Trans-455

PARTICIPATION OF PHASE-BOUNDARY REACTIONS IN THE OXIDATION OF METALS AND ALLOYS AT HIGHER TEMPERATURES. (Uber die Mitwirkung von Phasengrenzenreaktionen bei der Oxydation von Metallen und Legierungen bei Hoheren Temperaturen). K. Hauffe and H. Pfeiffer. Translated by R. C. Murray from Z. Elektrochem. 56, 390-8(1952). 16p. (AD-35867).

Experimental data on the oxidation of Fe to FeO at 1000°C and the sulfiding of Ni to NiS at 670°C, can not be interpreted on the basis of the parabolic rate low or Wagner's scaling theory, because phase-boundary reactions are rate-determining. It has been found that the presence of metal oxide vapors (MoO_3, Si_2O) in the corroding atmosphere, can either raise or lower the rate of oxidation of metals and alloys, which is explained on the basis of the defect theory as applied to heterotype mixed phases. (tr-auth)

7745 TT-579

THE STATE OF ALUMINA IN MOLTEN SLAG. (O sostoianii glinozema v rasplavlennykh shlakakh). O. A. Esin and B. M. Lepinskikh. Translated by G. Belkov from Doklady Akad. Nauk S.S.S.R., 91, 1187-90(1953). 8p.

In considering the form of silica in liquid slags, alumina occurrence in the form of the anion (AlO_2^-) is assumed. However, the phase diagram indicates, in addition to $CaO{\cdot}Al_2O_3$, a series of congruently melting compounds; $5CaO{\cdot}3Al_2O_3$, $2CaO{\cdot}Al_2O_3{\cdot}SiO_2$ and $CaO{\cdot}Al_2O_3{\cdot}2SiO_2$. Their anions can also occur in a melt. (auth)

7746

AN INVESTIGATION OF THE SODIUM–POTASSIUM EQUILIBRIUM DIAGRAM. D. K. C. MacDonald, W. B. Pearson, and Lois T. Towle (National Research Council, Ottawa, Canada). Can. J. Phys. 34, 389-94(1956) April.

The study of fundamental properties such as specific heat and electrical resistivity in pure metals has made it very important to know the influence of small amounts of impurity. This has led the authors to undertake a detailed investigation of the Na–K equilibrium diagram. Previous work had indicated zero solid solubility at each limit (100% Na; 100% K) but the present investigation shows in particular that solubility extends to a few per cent from either limit. (auth)

7747

ON SOLID SOLUTIONS OF METAL COMPOUNDS OF THREE OR MORE COMPONENTS. I. I. Kornilov (Baĭkov Inst. of Metallurgy). Doklady Akad. Nauk S.S.S.R. 106, 476-8(1956) Jan. 21. (In Russian)

The formation of continuous solid solutions between metallic compounds was discussed in the previous study, where it was stated that such solutions are possible only for compounds of homogeneous crystalline lattice, with similar chemical bonds and atomic similarity of the elements. Among possible solid solutions are nickel compounds, aluminites, titanites, niobides, tantalides, borides, silicides, and carbides; also, the semi-conducting compounds of sulfides, selenides and arsenates. A preliminary study of triple solid solutions was made with Ni_3Ti–Ni_3Nb–Ni_3Ta which after 100 hr of diffusion annealing at 1250°, became an alloy of homogeneous structure. X-ray investigations of the triple alloy showed the homogeneous system of lines of a hexagonal lattice. The microscopic and x-ray analyses showed the existence of continuous solid solutions in the triple system of Ni_3Ti–Ni_3Nb–Ni_3Ta metallic compounds. Consequently, it is possible to assume formation of quadruple continuous solid solutions of TiB_2–VB_2–NbB_2–TaB_2; $TiSi_2$–VSi_2–$NbSi_2$–$MoSi_2$; VC–NbC–TiC–MoC, and others,

as well as limited quadruple solutions of $Ni_3Ti-Ni_3Nb-Ni_3Ta-Ni_3Al$; $Ni_3Ti-Co_3Ta-Ni_3Ta-Ni_3Al$; $TiB_2-ZrB_2-HfB_2-MoSi_2$ and others. The properties of solid solutions of metallic compounds differ widely from the properties of solid solutions of metals and should be called molecular solid solutions of metallic compounds. (R.V.J.)

7748

CHEMICAL SEPARATION AND ANALYSIS OF METALLIC COMPOUNDS FORMED IN SOME NICKEL ALLOYS. R. B. Golubtsova and L. A. Mashkovich (Baĭkov Inst. of Metallurgy). Doklady Akad. Nauk S.S.S.R. 106, 1011-14(1956 Feb. 21. (In Russian)

Studies and experiments concerning the solubility conditions of Ni_3Ti intermetallic compounds and nickel hard solutions (with 5% Ti) in various media, as well as the experiments on measuring the difference of potentials confirmed the fact that electrolytes containing nitric acid are the most effective in securing the segregation of Ni_3Ti phase. In the Ni–Ti binary alloy and in the triple alloy Ni–Ti–Cr these electrolytes separate a phase which equals to the intermetallic compound Ni_3Ti. (R.V.J.)

7749

TANTALUM. Chester Placek and Donald F. Taylor (Fansteel Metallurgical Corp., Chicago). Ind. Eng. Chem. 48, 686-95(1956) Apr.

7750

METHOD OF REPRESENTING PREFERRED ORIENTATION DATA. L. K. Jetter, C. J. McHargue, and R. O. Williams (Oak Ridge National Lab., Tenn.) J. Appl. Phys. 27, 368-74 (1956) Apr.

For the fiber-texture type of preferred orientation, a method is developed for determining the "fiber axis density" from the "pole density" given by x-ray-diffraction data. The fiber axis distribution so deduced gives directly and quantitatively the type and degree of preferred orientation—the more preferred crystallographic directions of the fiber axis, the symmetries of the orientation distribution about the preferred directions, and the relative volumes of material associated with the various components. The procedure is demonstrated for extruded aluminum rod. The method is adapted to the study of the sheet-texture type of preferred orientation and applied in determining the textures in cold-rolled 65–35 brass and 2S aluminum sheet. (auth)

7751

"PSEUDO-MONOCRYSTALS" OF ALPHA-TITANIUM. Henry Leidheiser, Jr. and Francis J. Denise (Virginia Inst. for Scientific Research, Richmond). J. Chem. Phys. 24, 625-6(1956) Mar.

Pseudo-monocrystals of titanium were formed by thermal cycling commercial Ti at 850 and 1200°C. These "crystals" were highly oriented. Changes in physical dimensions and x-ray patterns in these specimens were observed after heat treatment at 840 to 850°C. (C.W.H.)

7752

THE MACHINING PROPERTIES OF NON-FERROUS METALS. D. F. Galloway (Production Engineering Research Association, Melton Mowbray, Leics, England). J. Inst. Metals 84, 121-31(1956) Feb.

Descriptions of apparatus for the measurement of cutting forces and tool shape are given, and considerations influencing the design of experiments are discussed. The diversity of the machining properties of non-ferrous alloys is exemplified by comparisons of cutting forces for a range of non-ferrous and ferrous alloys. The combined effects of cutting speed and feed rate on tool life are shown in special charts, which indicate optimum cutting conditions. Results are given of experiments carried out to determine variations in surface finish with cutting speed, feed, cuttingtool material, and orientation of a faceted diamond tool. The concept of machinability expressed in terms of a single rating or index obtained from so-called machinability testers is discussed, and it is shown that the validity of simplified machinability tests in production practice is contingent on there being sufficient evidence of adequate correlations between the results of the tests and performance under production conditions. (auth)

7753

RESEARCH INTO SOME METAL-FORMING AND SHAPING OPERATIONS. W. Johnson (University of Sheffield, England). J. Inst. Metals 84, 165-79(1956) March.

The results of experimental and theoretical investigations in drawing and redrawing show the effects of speed and lubrication on ironing and flanging. Residual stresses were measured in cold drawn tubes and the theory of coining was developed for lead and aluminum. Deformation in slow speed impact extrusion was shown to happen rapidly in a small region near the die throat. (F.S.)

7754

METALLURGICAL RESEARCH AND DEVELOPMENT FOR NUCLEAR POWER. H. K. Hardy (U. K. Atomic Energy Authority (Industrial Group) Springfields Laboratories, Lancs, England). J. Inst. Metals 84, 229-38(1956) March.

Studies of the Calder Hall thermal reactor and the Dounreay experimental fast reactor indicate the time allowed to design fuel elements aiming for higher operating temperatures, increased life under irradiation, reliability, and greater ease in fabrication. (F.L.S.)

7755

METALLURGICAL RESEARCH IN NUCLEAR POWER PRODUCTION. J. G. Ball (Atomic Energy Research Establishment, Harwell, Berks, England). J. Inst. Metals 84, 239-50(1956) March.

The range of metals of special interest in nuclear energy is described, and an account is given of the features of reactors which influence metallurgical problems. These problems are discussed under the headings: (1) irradiation stability, (2) thermal stability, (3) sheathing materials, (4) corrosion, (5) fabrication, and (6) alloying and physical properties. (auth)

7756

SELECTION OF CANNING MATERIALS FOR REACTORS COOLED BY SODIUM/POTASSIUM AND CARBON DIOXIDE. A. B. McIntosh and K. Q. Bagley (U. K. Atomic Energy Authority (Industrial Group), Culcheth, Lancs, England). J. Inst. Metals 84, 251-70(1956) March.

Theoretical considerations and experimental investigations indicate such metals as beryllium, zirconium, niobium, vanadium, tungsten, and molybdenum will be used for canning materials provided difficulties in extraction and fabrication can be overcome. (F.S.)

7757

Zr AND Hf PRODUCTION TAILORED TO YIELD THREE PRODUCTS. W. W. Stephens and C. Q. Morrison (Carborundum Metals Co., Akron, N. Y.). J. Metals 8, 334-7(1956) Mar.

7758

FABRICATION OF THORIUM POWDERS. W. W. Beaver, K. G. Wikle, and J. G. Klein (Brush Beryllium Co., Cleveland). J. Metals 8, 445-54(1956) Apr.

Consolidation of hydride process, electrolytic, calcium reduced, and comminuted thorium powder, as well as saw chips and lathe turnings, by vacuum hot pressing and by cold pressing-vacuum sintering was studied. The mechanical properties of the consolidated material in the extruded form are compared with those of wrought castings. (auth)

7759

METALLOGRAPHIC IDENTIFICATION OF NONMETALLIC INCLUSIONS IN URANIUM. R. F. Dickerson, A. F. Gerds,

and D. A. Vaughan (Battelle Memorial Inst., Columbus, Ohio). J. Metals 8, 456-60(1956) Apr.

This investigation has developed metallographic means for distinguishing the several nonmetallic inclusions (MgF_2–CaF_2, UC, UH_3, UO, UO_2, and UN) in uranium. The work was done with the type of metal most commonly encountered by uranium metallographers. The methods described for identifying the various inclusions should prove useful in estimating metal quality. (auth)

7760

THERMODYNAMICS OF THE TITANIUM CHLORIDES. I. HEAT OF FORMATION OF TITANIUM TRICHLORIDE. David G. Clifton and George E. MacWood (Ohio State Univ., Columbus). J. Phys. Chem. 60, 309-11(1956) Mar.

The heat of formation of titanium trichloride has been determined by measuring the heats of solution of $TiCl_4$(l) and $TiCl_3$(s) in a solvent of HCl–$FeCl_3$ in an ice calorimeter. The heat of formation of the trichloride is based upon the heat of formation for $TiCl_4$(l) of -192.1 ± 0.6 kcal/mol. The value obtained for the heat of formation of $TiCl_3$(s) at 298°K. is -172.2 ± 0.7 kcal/mol. (auth)

7761

THERMODYNAMICS OF THE TITANIUM CHLORIDES. II. HEAT OF FORMATION OF TITANIUM DICHLORIDE. David G. Clifton and George E. MacWood (Ohio State Univ., Columbus). J. Phys. Chem. 60, 311-13(1956) Mar.

The heat of formation of titanium dichloride has been determined by two independent methods. In the first method the heats of solution of $TiCl_4$(l) and $TiCl_2$(s) in a solvent of HCl–$FeCl_3$ were measured. In the second method the heats of solution of $TiCl_3$(s) and $TiCl_2$(s) in an HCl solution were used. The two values obtained are -123.3 ± 0.7 and -123.7 ± 1.0 kcal/mol, based on -192.1 ± 0.6 kcal/mol for the heat of formation of $TiCl_4$(l). (auth)

7762

THERMODYNAMICS OF THE TITANIUM CHLORIDES. III. THE SUBLIMATION PRESSURE OF TITANIUM TRICHLORIDE. Benjamin S. Sanderson and George E. MacWood (Ohio State Univ., Columbus). J. Phys. Chem. 60, 314-16 (1956) Mar.

Experimental measurements have been made of the sublimation pressure of $TiCl_3$ over the temperature range 628 to 823°K. by the transpiration method. From these results, the heat and free-energy of sublimation of 298°K. are found to be 42.0 ± 0.5 kcal/mol and 29.6 ± 1.0 kcal/mol. The heat of formation at 298°K. of gaseous $TiCl_3$ based on this work and the previously reported heat of formation of the solid is -130.2 ± 1.4 kcal/mol. (auth)

7763

THERMODYNAMICS OF THE TITANIUM CHLORIDES. IV. THE DISPROPORTIONATION OF TITANIUM TRICHLORIDES. Benjamin S. Sanderson and George E. MacWood (Ohio State Univ., Columbus). J. Phys. Chem. 60, 316-19(1956) Mar.

The disproportionation equilibrium of $TiCl_3$ was studied in the temperature range 593 to 821°K. by an effusion and static method. The two sets of measurements do not agree and indicate that the vaporization coefficient of $TiCl_4$(g) is of the order of 10^{-4}. On the basis of the static measurements and previous work, a consistent set of thermodynamic properties of $TiCl_2$ and $TiCl_3$ are given. (auth)

7764

THE DIFFUSION OF CHROMIUM IN TITANIUM STUDIED BY AN AUTORADIOGRAPHIC METHOD. A. J. Mortlock and D. H. Tomlin (Univ. of Reading, England). Proc. Phys. Soc. (London) B69, 248-50(1956) Feb. 1.

It is noted that the autoradiographic method allows several diffusion experiments to be carried out on a single diffusion sandwich. Typical results of the penetration of diffused Cr in Ti–Cr alloy are plotted. (B.J.H.)

7765

A COMPARISON OF THREE RADIOACTIVE TRACER METHODS FOR STUDYING THE DIFFUSION OF CHROMIUM IN TITANIUM. A. J. Mortlock and D. H. Tomlin (Univ. of Reading, England). Proc. Phys. Soc. (London) B69, 250-2 (1956) Feb. 1.

A comparison was made of the measurement of the diffusion of Cr in Ti by autoradiography, liquid counting, and surface counting. It is estimated that the experimental error in the values of the diffusion coefficient determined from each of the three methods is between 5% and 10%. (B.J.H.)

7766

METALLURGICAL EXAMINATION OF GAMMA-ACTIVE MATERIALS. B. W. Mott (Atomic Energy Research Establishment, Harwell, Berks, England). Research (London) 9, 95-8(1956) Mar.

Various techniques for the preparation and examination of sections from gamma-active materials are described. (auth)

7767

ON THE WEAR RESISTANCE AND HARDNESS OF ELECTROLYTIC CHROMIUM PLATING. A. V. Shreĭdev. Zhur. Priklad. Khim. 29, 73-82(1956) Jan. (In Russian)

7768

THE STRESS-RUPTURE STRENGTH OF TYPE 347 STAINLESS STEEL UNDER CYCLIC TEMPERATURE. E. E. Baldwin (Knolls Atomic Power Lab., Schenectady, N. Y.). Trans. Am. Soc. Mech. Engrs. 78, 517-25(1956) Apr.

Stress-rupture tests of Type 347 stainless steel were conducted in liquid sodium under constant and cyclic temperature conditions. Constant-temperature tests were conducted at temperatures between 1000 and 1200°F. Cyclic-test temperatures ranged from 416 to 1294°F, and cycle times ranged from 6 to 12 hr. It was concluded that the deviation of the test results from the rupture life calculated by the method of Robinson and Miller was due to transient creep of the steel under cyclic-temperature changes. (auth)

7769

DESIGN ASPECTS OF HIGH-TEMPERATURE FATIGUE WITH PARTICULAR REFERENCE TO THERMAL STRESSES. L. F. Coffin, Jr. (Knolls Atomic Power Lab., Schenectady, N. Y.). Trans. Am. Soc. Mech. Engrs. 78, 527-32(1956) Apr.

A criterion for fatigue failure has been proposed, based on experiments carried out on test specimens subjected both to constrained thermal cycling and constant-temperature strain cycling. This criterion relates the number of cycles to failure with the plastic strain change per cycle. The application of such a criterion to design, where thermal-stress fatigue is the principal factor, is discussed from fundamental and practical viewpoints. From such a criterion it is possible to predict the life of a certain machine part for a calculated thermal stress, or conversely, the thermal stress permitted for a certain limiting number of cycles of stress. (auth)

7770

APPROXIMATE SOLUTION TO THERMAL-SHOCK PROBLEMS IN PLATES, HOLLOW SPHERES, AND CYLINDERS WITH HEAT TRANSFER AT TWO SURFACES. A. Mendelson and S. S. Manson (NACA Lewis Flight Propulsion Lab., Cleveland, Ohio). Trans. Am. Soc. Mech. Engrs. 78, 545-53(1956) Apr.

An approximate method for computing transient thermal stresses in hollow cylinders, plates, and hollow spheres is presented. The method makes use of polynomial approximations to the temperature distribution by means of which the partial differential equation of the problem is reduced to a set of first-order ordinary differential equations. Nonuniform initial temperature distribution and heat transfer

from both surfaces can be treated without difficulty making possible the practical solution of problems with relatively little labor for which an exact solution requires a great expenditure of labor and time. Several examples are presented and compare favorably with more accurate solutions. (auth)

7771
THERMAL PROPERTIES OF TITANIUM ALLOYS AND SELECTED TOOL MATERIALS. E. G. Loewen (Massachusetts Inst. of Tech., Cambridge). Trans. Am. Soc. Mech. Engrs. 78, 667-70(1956) Apr.

Thermal conductivity has been determined of five titanium alloys, four high-speed-steel alloys, and four types of tungsten-carbide tool materials, over a temperature range of 200 to 1000°F. In addition, the specific heat of two titanium alloys has been found between 70 and 1400°F. (auth)

7772
RUPTURE PROPERTIES OF INCONEL WELDMENTS AT 1400, 1600 and 1800°F. D. A. Scott (International Nickel Co. of Canada, Ltd., Ottawa, Ontario). Welding J. (N.Y.) 35, 161-s-3-s(1956) April.

Rupture tests performed on plate, arc weld metal, and inert gas and post-welded heat-treated weldment samples of Inconel show joint efficiencies up to 10,000 hr rupture life at 1400, 1600 and 1800°F. (F.S.)

7773
A WELD CRACKING SUSCEPTIBILITY TEST FOR SHEET MATERIALS. John S. Boudreau (General Electric Co., Lynn, Mass.). Welding J. (N.Y.) 35, 164-s-8-s(1956) April.

A quantitative test developed for the determination of the weld cracking properties of sheet materials is believed to be a reliable tool for the determination of weldability of specific materials. Predictions of the welding behavior of some new allovs are made. (F.S.)

7774
EFFECT OF COLD WORK ON THE MECHANICAL PROPERTIES OF PRESSURE VESSEL STEELS. W. T. Lankford (United States Steel Corp.). Welding J. (N.Y.) 35, 195s-206s(1956) April.

The Pressure Vessel Research Committee reviews and appraises the present state of knowledge regarding the effects of cold work on the strength properties, ductility, fracture stress, notch toughness, prior strains on weldments, and elevated temperature properties of steels. (F.S.)

7775
THE EFFECT OF INTERELECTRONIC COLLISIONS ON THE ELECTRICAL CONDUCTIVITY AND SKIN EFFECT IN METALS. V. L. Ginzburg and V. P. Silin (P. N. Lebedev Inst. of Physics, U.S.S.R.). Soviet Phys. JETP 2, 46-54 (1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 64-74(1955) July. (In Russian)

The effect of collisions between electrons on the electrical conductivity, thermal conductivity and skin effect in metals is considered. The question of electronic viscosity is discussed. It is shown that taking account of interelectronic collisions does not introduce notable changes into the results of the theory of the anomalous skin effect in metals. (auth)

Refer also to abstracts 7475, 7592, 7634, 7653, 7829, 8037 and 8075.

PHYSICS

7776 ANL-5498
Argonne National Lab., Lemont, Ill.
PHYSICS DIVISION SUMMARY REPORT [FOR] MAY THROUGH OCTOBER 1955. June 1956. 137p. Contract W-31-109-eng-38. $0.65(OTS).

Experimental Nuclear Physics. Resonance parameters were determined for several of the lower energy resonances in Br. These parameters are listed. A preliminary run on the Van de Graaff generator was completed using an externally pulsed proton beam on a Li target to produce neutrons. Time-of-flight measurement and detection techniques are discussed. Differential scattering cross section measurements made on Na^{23} were in agreement with published values. Energy states in P^{30} were investigated by means of the $S^{32}(d,\alpha)P^{30}$ reaction. A ground state Q of 4.831 ± 0.020 Mev, excited states at 0.655 and 0.975 Mev, and an isotopic spin T = 0 is indicated. An investigation of Ba^{139} decay resulted in a proposed decay scheme. Decay schemes are also proposed for Ca^{49} and Sc^{49}. Other decay studies are discussed. Atomic beam studies of active 54-min In^{116m} were carried out on the atomic $P_{\frac{1}{2}}$ state. Resonances at 7.30 and 27.93 Mc/sec, spin I = 5, μn = +4.4, and hyperfine splitting at 9000 Mc/sec were determined. In connection with the neutron cross section project, techniques were developed which give improved target neutron yield and more accurate time-of-flight measurements. The transmission cross sections of Na, Cr, Al, and Fe were measured. These measurements are discussed and the results tabulated. Measurements of Bi, Cr, Fe, and Ni S-wave type resonances were made and analyzed. Results are given. Progress in the spectrometer development program is reviewed. Study of He^3 excitation states as a result of H^3 β^- decay was continued. Available information is reviewed, and the development of applicable experimental techniques is discussed. Scintillator studies were continued. The performance of gas, liquid, and plastic experimental phosphors is discussed. The electrical properties of Plexiglas were measured. Plots of conductivity as a function of temperature and current as a function of potential are given and discussed. Mass Spectroscopy. Sources of error in meteorite age determination of Pb analysis are discussed. Fe impurities, a major source of error, are more satisfactorily removed by ion exchange than by the previously used sulfide precipitation. The capture cross section of K^{39} for EBR neutrons was determined as <4 mb. Studies of ion bombardment of solid targets was continued with some success, using Pb and Sn targets. The mechanism of target ion emission is not yet clear. Theoretical Physics. A preliminary measurement of the inelastic cross section of Na^{23} in the energy range 440 to 700 kev was carried out. The results are shown. Notes on neutron scattering theory, quantized space time, S-matrix definition, and field theory are included. Electronic digital computer development and operation are reviewed. (For preceding period see ANL-5497.) (D.E.B.)

7777 IGR-R/CA-159
Gt. Brit. Capenhurst Works. Ches., England.
EFFECT OF ECCENTRICITY AND WHIRL ON BACK DIFFUSION IN SLEEVE GLANDS. M. G. Davies. Dec. 30, 1955. 20p. (IGC-CTC/R-156; IGC-DDC/P-185).

The diffusion of one gas against a stream of another gas, in the annular space between a sleeve gland and a rotating shaft, is considered. Experiments are described to find in what conditions the distribution of concentration of diffusing gas agrees with that given by the simple diffusion theory. It is concluded that the theory is inadequate when the shaft runs eccentrically or whirls in the sleeve; the effective length can easily be halved. An explanation for this is suggested. Two methods are given for the calculation of diffusion coefficients. (auth)

7778 LA-1994
Los Alamos Scientific Lab., N. Mex.
MATHEMATICAL ANALYSIS OF GALVANIC CORROSION.

PART VII. SOME POTENTIAL FUNCTIONS FOR SPHERICAL ELECTRODE SYSTEMS. John M. Ruth and James T. Waber. Sept. 15, 195[5]. 17p. Contract W-7405-eng-36. $0.25(OTS).

Galvanic corrosion has been studied for electrode systems in which the anodes are spherical caps and the cathodes lie in the same spherical surface. The electrolyte has been assumed to be contained in a concentric spherical shell. The potential distribution has been expressed as a Fourier-type series involving a Legendre polynomial in each term. The radial dependence changes, depending on whether the electrolyte is inside or outside the sphere, and is further different for the two limiting cases: the electrolyte fills the sphere and the external spherical shell is infinite. These various forms of the radial dependence D^{*}_{2n} (r) are tabulated. The interfacial potential and the corrosion current parameter are also expressed in terms of modified forms of D^{*}_{2n} (r). The different radial derivatives of D^{*}_{2n} (r) are tabulated. (auth)

7779 NP-5921

Mine Safety Appliances Co., Callery, Penna.

PORGRESS REPORT NO. 33 FOR FEBRUARY AND MARCH 1956. W. J. Posey, ed. Apr. 9, 1956. 57p. Contract NObs-65426.

Progress is reported on the tests made on models of the S2G steam generators. Modifications of a 1000 kw test unit were made to permit adequate testing of the 3000-kw generators. The cyclic test program for the S2G is outlined. Typical Na flow data are given for the cyclic testing of the S2G evaporator. The operational history of this evaporator is also discussed. Progress is also reported on research pertaining to liquid metal system components, including fundamental heat transfer studies and component development and testing. Diagrams are given of the steam generators and tube joints. Operating characteristics of the liquid metal system are tabulated. The ability of transition welds to withstand the rapid temperature changes anticipated during scram conditions was studied. The suitability of stainless steel bellows for use in 8-in. S2G sodium valves was also studied. Results are given of 14 runs to determine the minimum velocity necessary to remove entrained gas by forcing it downward through the 5½-ft vertical leg for separation in the lower expansion tank. The nitriding of metals in Na is also discussed. The weight losses of Be specimens in 900°F Na are shown. A study was made of the characteristics of water–NaK leaks and applicable sealing methods. Data are given on the corrosion rate of Cr–Mo steel samples in NaK. It was found that the solubility of O_2 in NaK is dependent on K concentration. A study was made of radiation hazards arising from hole and valve gland leaks in a simulated, contaminated H_2O cooling system of a nuclear reactor. A schematic diagram is given of an inpile loop for testing proposed reactor organic moderator-coolants. Operational data for the loop containing isopropyl diphenyl are included. Tests were made to determine the extent of the hazard resulting from mixing hot diphenyl and H_2O. (B.J.H.)

7780 NP-5927

Carnegie Inst. of Tech., Pittsburgh. Metals Research Lab.

STUDY OF SPIRAL GROWTH DURING VAPOR DEPOSITION OF METALS. Final Report for the period March 15, 1954–March 15, 1956. Warren I. Pollock and Robert F. Mehl. Mar. 15, 1956. 173p. DA Project Nos. 599-01-004 and 5B99-01-004. Contracts DA-36-061-ORD-411 and DA-36-061-ORD-474.

The macroscopic spiral growth of cadmium crystals was observed and studied during actual deposition from cadmium vapor with a Linnik interferometric microscope. These spirals, visible at 75X and having heights between 300 and 2000 A, occur at the ridge boundaries of crystals grown on substrates formed by melting and then freezing deposits of cadmium which were sublimed from the vapor phase. A sequence of photograms illustrating the stages of development and growth of these macroscopic spirals was interpreted to reveal the formation of the initial step-line, which thereafter grows spirally. A "solid-louver" (escarpment) forms at the ridge boundary; one end of the solid-louver moves to the edge of the underlying crystal and on reaching the edge, the initial spiral step-line is formed. Many unresolvable small height step-lines emanating from the center of the spiral can conglomerate into a large height step-line, which is visible, some distance from the center of the spiral. Conversely, step-lines during growth can dissociate into smaller steps. (auth)

7781 NP-5928

Duke Univ., Durham, N. C.

EXPERIMENTS AT LIQUID HELIUM TEMPERATURES. Final Report for period December 29, 1952 to December 28, 1955. William M. Fairbank. 17p. DA Project No. 5B99-01-004. Contract DA-36-034-ORD-1180.

Experiments in low temperature physics conducted over a three year period are briefly discussed. Experimental techniques and results either have been or are in the process of being published in journals or technical reports. A bibliography is given. The temperature and pressure dependence of nuclear susceptibility in He^3 and He^3–He^4 solutions, surface resistance of superconducting Sn, superconductivity theory, liquid He bubble chambers, amplitude dependence of the velocity of sound in liquid He II, liquid He dielectric constants, solid H nuclear resonance, and magnet design for nuclear resonance and adiabatic demagnetization experiments were investigated. (D.E.B.)

7782 NRL-4685

Naval Research Lab., Washington, D. C.

THE DEVELOPMENT OF THE NRL ELECTROCHEMICAL RECORDER PAPER. Final Report. E. J. Kohn, D. L. Venezky, R. G. Rice, F. J. Ross, and G. F. Asbury, Sr. Dec. 13, 1955. 43p. Project Nos. NE 050-962 and NR 604-020.

Experimental research at NRL has produced a new electrochemical recorder paper which may be used advantageously in present operational recorders and fulfills many of the paper requirements for new electrochemical recorder designs. The development of this paper consisted of three phases: Attempts to improve known recorder paper formulas. Search for a new formula, which resulted in the choice of benzidine as an electrochemical marking agent. Development of a three-bath impregnation process to utilize the benzidine. The eventual paper exhibited properties of high sensitivity, wide dynamic range, fine definition, high contrast, mark permanence, good wet-strength and long shelf-life, or storage stability. Exploratory research on a "self-erasing" or "reuseable" recorder paper and attempts to formulate a new dry recording medium are also described. (auth)

7783 NYO-7631

Princeton Univ., N. J. Palmer Physical Lab.

THE EFFECT OF A BUFFER GAS ON THE OPTICAL ORIENTATION PROCESS IN SODIUM VAPOR (thesis). Peter L. Bender. July 1956. 161p. Contract AT(30-1)-937, Scope II. $21.30(ph OTS); $6.90(mf OTS).

The effect of a buffer gas on the optical orientation process in sodium vapor is studied by observing the change in polarization of the scattered light when a disorienting magnetic field is applied. For low pressures the change in polarization increases linearly with the

buffer gas pressure, corresponding to the sodium atoms spending a longer time in the illuminated region. For higher buffer gas pressures the change in polarization reaches a maximum and then decreases, corresponding to disorientation by collisions with the buffer gas while the sodium atom is still in the excited state after absorbing a photon becoming important. An increase in the change in polarization by a factor 25 is achieved by the use of a buffer gas. Argon and nitrogen are found to give very similar effects, while helium gives a smaller increase because of its light weight and consequent ineffectiveness in keeping sodium atoms in the region of illumination. A theoretical treatment of the effect of collisions on the state of the excited sodium atom is carried out and an effective collision diameter of 9 A is found for mixing of the 3P states. A density matrix treatment is used to describe the effect of the collisions on the optical orientation process. The diffusion process is considered and a quite general expression found for the distribution of times spent by a particle in a subregion of a given region before hitting the wall. With the corresponding probabilities of scattering different numbers of photons, it is then possible to calculate the polarization of the scattered light and the orientation achieved. The agreement with experimental results for the change in polarization is fairly good, considering the approximations that were made. On the basis of the theory it is found that an average value of $\overline{M}_T = 0.6$ over the region of observation was reached, corresponding to 40% of the maximum possible orientation. It was also found that with a fairly simple apparatus an average orientation of 20 to 30% over the whole volume should be possible using a buffer gas. This degree of orientation is sufficient for angular distribution experiments with radioactive nuclei. With a buffer gas it is also possible to produce large differences in level populations for microwave resonance experiments with a small amount of light. (auth)

7784 WAL-111/23

Watertown Arsenal Lab., Mass.

TRUE STRESS VS. ELONGATION RECORDER. D. E. Driscoll and T. S. DeSisto. July 15, 1955. 22p. DA Project No. 593-08-022. (AD-83651).

An evaluation was made of the accuracy of the true stress vs. elongation recorder in tensile testing of metals. It was observed that the stress recorder can be used on practically all ferrous and non-ferrous metals to produce results that will usually have an error of not more than 1%. The recorder saves time and effort in the computations of true stress vs. elongation curves. By eliminating manual measurements the human error is minimized. (auth)

7785 AEC-tr-2496

MEASUREMENT OF SMALL VAPOR PRESSURES AT ELEVATED TEMPERATURES. V. THE PARTIAL PRESSURES OF THE COMPONENTS IN THE SYSTEM Fe–P. A. A. Granovskaya and A. P. Lyubimov. Translated by F. L. Yaggee from Zhur. Fiz. Khim. 27, 1437-42(1953). 4p.

A study in the measurement of the partial pressures of P and Fe above their common melt was made. Curves of the partial pressure as a function of either concentration in solution at three temperatures are shown and experimental data are tabulated. (auth)

7786 AEC-tr-2503

HEAT CONDUCTIVITY DETERMINATIONS WITH SODIUM AND POTASSIUM LYES OF DIFFERENT CONCENTRATION AND TEMPERATURE. L. Riedel. Translated from Chem. Ing. Tech. 22, 54-6(1950). 12p.

Heat conductivity of aqueous solutions of sodium and potassium hydroxide were determined with a stationary cylinder method in relation to the concentration and temperature. The results were evaluated uniformly on the basis of an evaluation of the effect of various dissolved ions on the heat conductivity of water and are represented in tables. (auth)

7787 AERE-Lib/Trans-704

THE POTENTIAL DIFFERENCE WITHIN THE PASSIVE FILM OF IRON. K. J. Vetter. Translated by F. Hudswell from Z. physik. Chem. (Frankfurt) (N. F.) 4, 165-74(1955). 11p.

A potential difference $\Delta\phi$, which causes ionic transport, must occur in the passive film of iron (which is about 50A thick) when a current flows. The independence, which was assumed in an earlier study, of the potential difference at the phase boundary between oxide and electrolyte is discussed in its theoretical and experimental aspects. The deviation of the potential from that of an iron-saturated oxide may exist, but must have a practically constant value in the region of the passive potential $\epsilon_h = 1.0$–1.65 volts. A substantial over-voltage cannot occur at this phase boundary. In the absence of current a potential difference cannot be developed even if there is corrosion. However, the very slow collapse of the potential after switching off an anodic current can be understood on account of the poor ionic conductance at small field strengths. The absolute position of the potential of formation and reduction (the Flade potential) cannot yet be indicated. An explanation, by considering an oxide which is richer in energy, or by means of an enhanced corrosion, is furnished for discussion. (auth)

7788

ON THE TIE BETWEEN THE CHEMICAL AND MECHANICAL STABILITY OF VERY HARD SOLIDS. B. F. Ormont. Doklady Akad. Nauk S.S.S.R. 106, 687-90(1956) Feb. 1. (In Russian)

Calculations were made of the surface energy correlations of friable hard solids: carbides, nitrides, and others. Relations of the thermodynamic character of the solids to their structure and chemical properties were investigated. Possible correlation of crystal hardness with the energy of its formation is discussed. (R.V.J.)

7789

HIGH TEMPERATURE DUST FILTRATION. Melvin W. First, J. Barrie Graham, Gurdon M. Butler, Glaire B. Walworth, and Roy P. Warren. Ind. Eng. Chem. 48, 696-702 (1956) Apr.

An investigation of some of the theoretical factors involved in the filtration of small particles to materials from gases at temperatures above 1400°F is reported. (auth)

7790

METHOD OF CHARACTERISTICS TECHNIQUE. APPLICATION TO HEAT AND MASS TRANSFER PROBLEMS. Andreas Acrivos (Univ. of California, Berkeley). Ind. Eng. Chem. 48, 703-10(1956) Apr.

A mathematical technique known as the method of characteristics, which has been used with great success in problems of compressible flow, can also be employed to solve numerically a large number of important chemical engineering problems in mass and heat transfer, with chemical reaction, in a packed bed. The method is capable of handling the most general problems of the above type with a one-dimensional mathematical model. It is simple and systematic, its accuracy at each step is checked and improved by the modified Euler method, and it can be made as accurate as is needed by constructing a finer mesh network of characteristics. Therefore, because of its simplicity and accuracy, the method of characteristics may become an extremely useful tool for many chemical engineering calculations. (auth)

7791

PULSED T-F EMISSION ELECTRON PROJECTION MICROSCOPY. W. P. Dyke and J. P. Barbour (Linfield Coll., McMinnville, Oreg.) J. Appl. Phys. 27, 356-60(1956) Apr.

Pulse electronic techniques extend the advantages of field emission microscopy to desirable experimental conditions not attained with steady-state fields. A visually continuous "motion picture" emission pattern enhances the study of transient cathode mechanisms while holding negligible the adverse effects of large electrostatic forces on both cathode stability and mechanisms under study. Observation is extended to elevated cathode temperatures, to higher environmental gas pressures, and to low tensile strength cathode materials; at the same time, excellent cathode electrical stability is maintained. Several mechanisms are illustrated, including condensation, volume diffusion, surface migration, and cathode blunting. (auth)

7792
THE MEASUREMENT OF CRYSTAL PHASE, LATTICE CONSTANT, AND ATOM RADIUS WITH FIELD EMISSION MICROSCOPES. M. Drechsler. Z. physik. Chem. (Frankfurt) [N. F.] 6, 272-85(1956) Mar. (In German)

7793
ON THE INTERACTION OF BOUND ELECTROMAGNETIC RESONATORS WITH A BEAM OF CHARGED PARTICLES. A. I. Akhiezer and Ya. B. Fainberg. Zhur. Tekh. Fiz. 25, 2516-25(1955) Dec. (In Russian)

The investigation showed that when a beam of charged particles, with continuous velocities above a certain critical term pass through a chain of coupled resonators, the fluctuating charge density and the velocities expand in the beam in a wave like shape of increasing amplitude. The electrical field also resembles the expanding waves of increasing amplitude. A connection was established between the waves of increasing amplitude and Cherenkov radiation in dielectric or periodic structure. (auth-tr)

7794
ON RADIATION OF A CHARGED PARTICLE MOVING THROUGH COUPLED RESONATORS. A. I. Akhiezer, G. Ya. Lyubarskiĭ, and Ya. B. Fainberg. Zhur. Tekh. Fiz. 25, 2526-34(1955) Dec. (In Russian)

A problem of radiation of a charged particle uniform motion in periodical structures is studied. It is shown that this radiation may be treated as a resonance between the natural oscillation of the structure and a certain driving force combined with the moving particle. A correlation determining the spectrum of radio frequencies was determined. Doppler effect with oscillating motion of periodical structures was investigated. (auth-tr)

AEROSOLS

7795
ON THE PRINCIPLE OF ALPHA IONIZATION GAS ANALYZER ACTION. N. I. Shteĭnbok. Zhur. Tekh. Fiz. 26, 175-80(1956) Jan. (In Russian)

Experimental and theoretical data show that the alpha ionization gas analyzer action principle varies with the amount of concentration in the analyzed gas admixtures. Alpha ionization gas analyzers can be used for measurements of large and small admixture concentrations of gas, vapors, and smoke in air and other gases, but the experiments indicated that they are best suited for the use in laboratory, industry, and sanitary engineering practice for measurements of the small content of vapor and smoke admixtures in the air with the concentration order of tenths, hundredths, and thousandths of percent. (R.V.J.)

COSMIC RADIATION

7796 NM-001-059.13.07
Naval School of Aviation Medicine, Pensacola, Fla.
THE CROSS SECTION FOR THIN-DOWN HITS FROM HEAVY NUCLEI OF THE PRIMARY COSMIC RADIATION IN BIOLOGICAL EXPERIMENTATION. Hermann J. Schaefer. Jan. 12, 1954. 25p. (AD-37053).

A complete mathematical analysis is presented of the target geometry for different biological target objects. Formulas were derived for computing the hit frequencies of different targets at all altitudes. Since the ranges of the incident particles must be known for these calculations, the commonly used spectra were converted accordingly for all components of the heavy primaries for all altitudes. (auth)

7797 TT-581
MEASUREMENTS OF COSMIC RAY PROTONS. (Misure su protoni dei raggi cosmici). C. Baccalin, P. Bassi, and C. Manduchi. Translated by D. A. Sinclair from Nuovo cimento (10) 1, 657-68(1955). 17p.

An abstract of this paper appeared in Nuclear Science Abstracts as NSA 9-4493.

7798
ON SPECTRA OF PROTONS AND π^- MESONS AT SEA LEVEL. L. I. Potapov and N. V. Shostakovich (Lebedev Inst. of Physics). Doklady Akad. Nauk S.S.S.R. 106, 641-4 (1956) Feb. 1. (In Russian)

Proton and π^--meson momentum spectra at sea level was measured with an Alikhanyan-Alikhanov magnetic spectrometer. A magnetic field of 7500 gauss was created by an electromagnet with poles 58 cm long and 20 cm wide and with 10 cm clearance. The experiment was carried out in three variations, which differed by the number and the location of the counters in the series placed and the magnetic poles. Results of the studies established the fact that π^--meson number reduced sharply with the increase of momentum. An increase in particle number was observed, also, in the momentum range near to 1 Bev/c which cannot be explained as merely statistical fluctuations. In determining the particle mass of the abnormal ionization and momentum group it was decided that these particles, obviously, are heavy mesons with the mass of ~900 m_e. It is also possible that the group of particles observed in the range of 1 Bev/c are heavy mesons. (R.V.J.)

7799
LATERAL STRUCTURE OF EXTENSIVE AIR SHOWERS. D. S. Narayan (Tata Inst. of Fundamental Research, Bombay, India). Phys. Rev. 101, 1815-21(1956) Mar. 15.

The problem presented by air showers which have particle densities ~500 per sq meter around the shower axis and which have no multiple peaks with separations of more than a meter has been analyzed previously by Hazen et al. using Fermi's model of meson production. The object of this paper is to show that, contrary to the conclusion of Hazen et al., Fermi's model cannot generate such showers. On the other hand, it is shown that a modification by Bhabha, to the phenomenological models of meson production, which predicts greater angular concentration of the mesons produced in nucleon-nucleon collisions, can generate the showers of the type referred to above for a suitable choice of the parameter ϵ, which in this theory is the ratio of field mass to proper mass. (auth)

7800
ALBEDO OF COSMIC RAYS IN THE EARTH'S DIPOLE AND QUADRUPOLE MAGNETIC FIELD. Ruth Gall and Jaime Lifshitz (Istituto Nacional de la Investigacion Cientifica, Mexico City). Phys. Rev. 101, 1821-4(1956) Mar. 15.

Albedo trajectories for protons of 0.5, 1.0, 1.5, and 2.0 Bev in the earth's dipole and quadrupole magnetic field were computed. The zenithal, azimuthal, latitude, and magnetic rigidity effects were studied. The quadrupole induces an asymmetry which seems only to be important near the geomagnetic equator. Shadow cones were obtained for one point of incidence. (auth)

7801
SEARCH FOR A SIDEREAL VARIATION OF THE COSMIC RAY INTENSITY AT HIGH ENERGIES. J. K. Crawshaw and H. Elliot (Manchester Univ., England). Proc. Phys. Soc. (London) A69, 102-9(1956) Feb. 1.

Extensive air showers with energies of about 10^{16} ev and 10^{17} ev have been recorded at geographic latitude 53° N by means of counter sets separated by about 150m and 300m. Harmonic analysis of the shower frequencies has revealed no evidence for a sidereal daily variation with amplitude exceeding the statistical uncertainties, which are 2.5 and 6% respectively. No evidence has been found for a solar daily variation with amplitude exceeding 2.5% for 10^{16} ev showers. A solar daily variation has been found for 10^{17} ev showers with an amplitude of 19% and a time of maximum at about 1300h. The interpretation of this result is briefly discussed. (auth)

7802
ON THE PROBLEM OF ANTI-PROTONS IN THE PRIMARY STREAM OF COSMIC RAYS. M. I. Fradkin (P. N. Lebedev Inst. of Physics, U.S.S.R.). Soviet Phys. JETP 2, 87-9(1956) Jan. (In English). Zhur. Eksptl.' i Teoret Fiz. 29, 147-50 (1955) Aug. (In Russian)

Analysis of data on the measurement of the east-west asymmetry of cosmic rays at high altitudes demonstrates that it is thoroughly impermissible to exclude the possibility of the presence of a certain proportion (up to 13%) of negatively charged particles in the primary flow. Computation shows that in the primary flow of cosmic rays, the proportion of anti-protons formed in interstellar space cannot exceed 0.2%, and apparently the presence of anti-protons cannot explain the results of measurement of east-west asymmetry. (auth)

7803
LARGE RECTANGULAR WILSON CHAMBER. I. L. Ivanovskaya, and A. G. Novikov. Zhur. Tekh. Fiz. 26, 209-12(1956) Jan. (In Russian)

A rectangular Wilson chamber designed for investigations of wide atmospheric showers in cosmic rays is described. A maximum possible effective area, sufficiently short effective chamber time to reduce the background of accidental particles, and sufficient quantities of substance in the chamber to produce effective recordings of nuclear interactions were considered in the design of the chamber. (R.V.J.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

7804 KAPL-1569
Knolls Atomic Power Lab., Schenectady, N. Y.
INTENSITY DISTRIBUTION OF THE X-RAY DIFFRACTION PATTERN OF A FINITE CRYSTAL CONTAINING POINT DEFECTS. J. B. Sampson and C. W. Tucker, Jr. July 13, 1956. 17p. Contract W-31-109-Eng-52. $0.20 (OTS).

The interpretation of changes in the intensity distribution of the x-ray diffraction pattern which are caused by point defects in crystals is discussed. A simple elastic model for the distortion of the lattice around the defects should provide an approximate description. However, in contrast to the case of the shift in position of the Laue spots caused by the introduction of point defects, the finite nature of the crystal should have no influence upon the intensity redistribution. (auth)

7805
ORDERING OF ATOMS IN THE σ PHASE. J. S. Kasper and R. M. Waterstrat (General Electric Research Lab., Schenectady, N. Y.). Acta Cryst. 9, 289-95(1956) Mar.

A neutron diffraction study has been made of the ordering of component atoms in the following σ phases: Ni−V, Fe−V, Mn−Cr. Definite evidence for ordering is found in all three systems, with different degrees of precision for the three systems. These results, with some x-ray investigations, enable a generalization to be made regarding the scheme of the ordering for binary σ phases of the first row transition elements (also those containing Mo). (auth)

7806
ON THE STRUCTURE OF SIMPLE FLUIDS. A. E. Glauberman and V. P. Tsvetkov (Franko L'vov State Univ.) Doklady Akad. Nauk S.S.S.R. 106, 623-5(1956) Feb. 1. (In Russian)

The functions of atomic distribution in fluids at various temperatures were studied in a crystalline lattice of gray and white tin, and in a tightly packed hexagonal lattice. The theoretical and experimental curves for the tightly packed hexagonal lattice showed the best agreement. (The lattices of the other types, except the above three, gave completely unsatisfactory results.) Experimental curves are given for the temperatures 237, 252, 269, 284, 301, 329, 345, 361, 375, 392, and 407°C. A graph is given showing the dependence of the structural diffusion coefficient on the temperatures in the investigated temperature range. (R.V.J.)

7807
POWDER DATA FOR ThF_4, 0.5-2.0 H_2O. O. S. Mills (Univ. of Sheffield, England). A reply to this paper by R. W. M. D'Eye of AERE is also included. J. Inorg. and Nuclear Chem. 2, 135-6(1956) Feb.

The crystal structure of ThF_4, 0.5-2.0 H_2O was investigated. Two space groups ($I2_12_12_1$ and Ibca) were deduced from existing x-ray powder photographs. Discussions of the possible space groupings are included. (C.W.H.)

7808
THE CRYSTAL STRUCTURE OF CESIUM MONOXIDE. Khi-Ruey Tsai, P. M. Harris, and E. N. Lassettre (Ohio State Univ., Columbus). J. Phys. Chem. 60, 338-44(1956) Mar.

The anti-$CdCl_2$ type layer structure[2] (D^5_{3d}-$R\bar{3}m$) of dicesium monoxide (Cs_2O) has been confirmed by x-ray single-crystal work. The variable parameter for the positions of the Cs atoms is found to be n = 0.256, instead of u = ¼ (powder work), which fails to account for some of the weak powder lines. The abnormally large Cs−Cs distance (Cs^+−Cs^+ = 4.19 A.) between layers and the slightly shortened Cs−O distance (Cs^+−$O^=$ = 2.86 A.) indicate that the cesium ions are highly polarized in this layer crystal. (auth)

7809
THE CRYSTAL STRUCTURE OF TRICESIUM MONOXIDE. Khi-Ruey Tsai, P. M. Harris, and E. N. Lassettre (Ohio State Univ., Columbus). J. Phys. Chem. 60, 345-7(1956) Mar.

Tricesium monoxide, Cs_3O, has been prepared and found to possess many metallic properties, a D^3_{6h}-$C_{\bar{6}}cm$ structure with two molecules per unit cell. The observed interatomic distances indicate that the bond between Cs and O_2 is ionic as in the crystal of Cs_2O, while the bond between Cs and Cs is metallic. (auth)

7810
THE CELLULAR METHOD FOR CLOSE-PACKED HEXAGONAL TITANIUM. B. Schiff (Imperial Coll., London). Proc. Phys. Soc. (London) A69, 185-6(1956) Feb. 1.

Incorrect irreducible representations used in "The Cellular Method For Close-Packed Hexagonal Titanium." Proceedings of the Physical Society A68, 686, are corrected. (D.E.B.)

Refer also to abstracts 7602 and 7750.

ELECTRICAL DISCHARGE

7811 OSR-TN-56-118
Pennsylvania State Univ., University Park.
FIELD ION EMISSION. PART I. EXPERIMENTAL INVESTIGATION OF FIELD ION EMISSION. Kanwar Bahadur. PART II. RESOLUTION OF THE ATOMIC STRUCTURE OF A METAL SURFACE BY THE FIELD EMISSION MICROSCOPE. E. W. Müller. Technical Report No. 2. Mar. 1956. 43p. Contract AF 18(600)-673. (AD-82514).

The apparatus, techniques, and results of field ion emission experimentation using He, Ne, A, Kr, and Xe are discussed. Results indicate ion current proportionality with pressure, agreement of experimental and theoretical values, and a slope of $\frac{3}{2}$ for the log I−log V curve. The field ion microscope is used to resolve the atomic structure of W. The microscope is discussed, and electron emission patterns are given. (D.E.B.)

7812
PARTIAL FUNCTION AND EFFECTIVE IONIZATION POTENTIAL OF THE ATOMS OF INTERIOR OF PLASMAS. G. Ecker and W. Weizel. Ann. Physik 17, 126-40(1956) Feb. (In German)

ELECTRONS

7813 UCRL-4704
California. Univ., Livermore. Radiation Lab.
MULTIPLE SCATTERING OF 2.39 MEV ELECTRONS IN NUCLEAR EMULSION. Charles E. Violet. May 1956. 18p. Contract W-7405-eng-48. $0.20(OTS).

The multiple scattering of 2.39 ± 0.09 Mev electrons in Ilford G-5 emulsion has been measured for cell lengths of 10, 20, and 40 microns. The independent data of three observers were combined to obtain the best value of the mean scattering angles with and without experimental cutoff. The corresponding scattering factors for cell lengths between 10 and 40 microns are $K_{co} = 24.9 \pm 1.2$ Mev degress/(100 microns)$^{0.59}$ (for a cutoff at 4 times the mean deviation) and $K_0 = 25.1 \pm 0.8$ Mev degrees/(100 microns)$^{0.58}$. The corresponding values from the Molière theory corrected (approximately) for inelastic collisons are 23.9 and 26.2, respectively. (auth)

7814
MEASUREMENTS OF ELECTRON DENSITIES WITH THE AID OF THE COMPTON SCATTERING PROCESS. Erik Odeblad and Ake Norhagen (Karolinska Institutet, Stockholm, Sweden). Acta Radiol. 45, 161-7(1956) Feb.

7815
POSITRON ELECTRON ANNIHILATION AND POSITRONIUM. III. G. M. Lewis (Glasgow Univ., Scotland). Atomics 7, 100-2(1956) Mar.

Some significant features of the annihilation process are indicated. Annihilation of an electron and positron pair occurs chiefly by two or three quantum emission according as the total spin of the particles is 0 or 1 respectively. Both bound and unbound states of the positron-electron system can occur. The bound states, constituting positronium, are of exceptional interest in view of the analogy with the hydrogen atom, and the fundamental nature of the two component particles. Positron and positronium lifetimes are discussed. (auth)

7816
EFFECTS OF RADIATION ON THE MOTION OF A RELATIVISTIC ELECTRON IN A MAGNETIC FIELD. A. A. Kolomenskiĭ and A. N. Lebedev. (Lebedev Inst. of Physics). Doklady Akad. Nauk S.S.S.R. 106, 807-10(1956) Feb. 11. (In Russian)

A relativistic electron moving in a magnetic field becomes a source of intense electromagnetic radiation. Quantum and classical methods can be used in the investigation of the motion and the radiation reaction. A. A. Sokolov in Zhur. Tekh. Fiz. 24, 249(1953) obtained for the mean quadratic fluctuation of the orbit radius the following expression: $\rho^2 = (55\sqrt{3}/144)r_0 \Lambda [\omega_0/(1-n)^2] \gamma^5 t$, $\gamma = E/mc^2$. Where r_0 is classical electron radius; ω_0 is the rotation frequency on the orbit, and n is the exponent of the magnetic field $H \sim r^{-n}$. The investigation established that the above expression and the other fluctuation effects, not mentioned in the Sokolov study, can be calculated by applying the classical betatron oscillation theory and considering the statistical losses of radiation. (R.V.J.)

7817
THE SCATTERING OF FAST CHARGED PARTICLES. I. ON THE SINGLE SCATTERING OF 13.5 MEV ELECTRONS IN XENON. K. R. Allen, M. M. Lipsicas, D. Major, and K. Phillips (Metropolitan-Vickers Electrical Co. Ltd., Manchester, England). Proc. Phys. Soc. (London) A69, 141-52 (1956) Feb. 1.

The scattering of fast electrons with a mean energy of 13.5 Mev has been investigated. Approximately 3000 stereoscopic pairs of photographs were obtained with a Wilson cloud chamber filled with Xe and He using a 20 Mev betatron as the source of high-energy electrons. A total length of corrected track of 1270 meters yielded 318 scatters greater than 5°. Comparison of these results with the Rutherford scattering gives a ratio which varies from unity at 0° to a maximum of 1.6 between 20° and 30°. An inverse square law dependence of scattering with energy is found. General agreement, within the statistical limits of the experiment, is obtained with the theoretical cross sections of Curr, McKinley and Feshbach, and Bartlett and Watson. (auth)

7818
NUMERICAL VALUES OF THE CONSTANT OF THE TRIPLET BETA-INTERACTION. D. A. Frank-Kamenetskii. Soviet Phys. JETP 2, 162-3(1956) Jan. (In English). Zhur. Eksptl. "i Teoret. Fiz. 29, 135-6(1955) July. (In Russian)

GASES

7819 BRL-MR-908
Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD OF EXTRAPOLATING EQUATION OF STATE DATA TO HIGHER TEMPERATURES. Roger A. Strehlow. July 1955. 16p. DA Project No. 5B0302001. (AD-71210).

An extrapolation technique for obtaining high temperature equation of state data from low temperature experimental data is presented. The method is based on the assumption that at any constant high pressure the Lennard Jones 6-12 potential gives the correct virial equation as the temperature approaches infinity. The procedure works well for A and N but a large discrepancy was found between the experimental data and the theory for CO_2. (auth)

7820 CM-850
Wisconsin. Univ., Madison. Naval Research Lab.
STUDIES ON THE DIFFUSION COEFFICIENTS OF BINARY GAS SYSTEMS. R. E. Bunde. Aug. 8, 1955. 159p. Contract NOrd-9938. (AD-74929).

The interferometric technique was employed for the measurement of the diffusion coefficients of three binary gas systems in the temperature range from 25°C to 85°C at one atm. pressure. A fourth system was used to study the concentration dependence of the diffusion coefficient at 25°C. Utilizing a typical Loschmidt-type cell employing a shear technique for opening and closing, the diffusion process was followed by measuring the time rate of change

of concentration at one point in the cell. A light path through the lower half-cell permitted the observation of the shift of the fringe pattern in a Mach-Zehnder interferometer caused by the continual change in the refractive index of the gas as diffusion progressed. The fringe pattern and time were recorded on film at selected intervals, while the integral fringe shift was obtained by visual observation. A toolmaker's microscope with a coordinate comparator stage was used to determine the fractional part of the fringe shift from the film. A knowledge of the integral fringe shift, time, temperature and pressure permitted the calculation of the diffusion coefficient. Values of the diffusion coefficient at one atmosphere pressure for pairs of gases among the single components H, N, and ammonia are presented. Concentration dependence studies on the fourth system, H–He, at 298.16°K and one atm. pressure are also described. (auth)

7821 OSR-TN-56-98
Brown Univ., Providence.
THE VISCOSITY OF FIVE GASES: A RE-EVALUATION. Technical Report No. 6. Joseph Kestin and Hung-En Wang. Mar. 1956. 26p. Contract AF 18(600)-891. (AD-82011).

A re-evaluation of the experimental results for the pressure dependence of viscosity obtained is made. The re-evaluation is based on an improved theory of the oscillating disk viscometer described in the present series. The results for air, nitrogen, argon, helium and hydrogen are given in graphical and tabular form as well as in the form of empirical equations. The range covered is 1 to 70 atm. at 25°C. The results constitute a relative measurement which is based on data for nitrogen. Very good agreement with previously published data for nitrogen, air, and hydrogen has been reported. In the case of helium no comparative data could be found and in the case of argon there is good agreement with the data published by Michels and others but the difference in absolute values is somewhat higher than the preceding three gases. The agreement as to rate of change with pressure is excellent. It is believed that the data now reported contain an uncertainty of no more than 0.2% for nitrogen, air, hydrogen and helium and of not more than 0.6% for argon with respect to nitrogen. (auth)

7822 DTMB-Trans-109
NATURAL VIBRATION AND DAMPING OF GAS BUBBLES IN LIQUIDS. (EIGENSCHWINGUNG UND DÄMPFUNG VON GASBLASEN IN FLÜSSIGKEITEN). Erwin Meyer and Konrad Tamm. Translated by F. A. Raven from Akust. Z. 4, 145-53(1939). 13p.

The coefficients of actual vibration, the natural frequency, and the damping decrement were determined for gas bubbles in liquids over a range of frequency from 1.5 to 35 kc. (F.S.)

7823
A GENERALIZED CORRELATION OF DIFFUSION COEFFICIENTS. J. R. Fair and B. J Lerner (Univ. of Texas, Austin). A.I.Ch.E. Journal 2, 13-17(1956) Mar.

Graphical correlations of binary gas diffusion coefficients are developed based on the Hirschfelder-Bird-Spotz diffusion equation and the theorem of corresponding states. A critical diffusion coefficient is defined and is used in turn for a definition of a "reduced" coefficient. The reduced diffusion coefficient is correlated graphically in generalized form in terms of the reduced properties of the diffusing gas. Using air as a reference "barrier" gas, the critical diffusion coefficients for various gases diffusing through a single barrier gas were compared with the critical coefficients for these gases through air. This ratio, termed the barrier gas ratio, was found to be independent of the properties of the diffusing gas. A graphical correlation of the barrier gas ratio enables rapid estimation of a binary diffusion coefficient with a minimum of information. (auth)

7824
ADSORPTION OF GASES ON A SILICON SURFACE. J. T. Law ans E. E. Francois (Bell Telephone Labs., Inc., Murray Hill, N. J.) J. Phys. Chem. 60, 353-8(1956) Mar.

An investigation of the adsorption of A, N_2, CO_2, CO, H_2, O_2 and H_2O vapor on a Si surface has been carried out using a mass spectrometer and a flash filament technique. All measurements were made at 300°K. and gas pressures between 10^{-7} and 10^{-4} mm. The decomposition of CO_2 and H_2O vapor at various temperatures has also been studied. (auth)

7825
THE KRYPTON AND XENON CONTENTS OF ATMOSPHERIC AIR. E. Glueckauf and G. P. Kitt (Atomic Energy Research Establishment, Harwell, Berks, England). Proc. Roy. Soc. (London) A234, 557-65(1956) Mar. 6.

The proportion of Kr and Xe in dry air has been measured by a method using distillation and low-temperature gas-chromatography for the isolation of Kr and Xe. The separation has been controlled by the use of radioactive ^{85}Kr tracer. The Kr content of dry air is $1.139 \pm 0.01 \times 10^{-6}$ by volume. The Xe content of dry air is $0.086 \pm 0.001 \times 10^{-6}$ by volume. (auth)

Refer also to abstracts 7595, 7681, and 7795.

INSTRUMENTS

7826 AECU-3123
[Sandia Corp., Albuquerque, N. Mex.]
SMALL-SCALE AUTOMATIC FIELD-DATA REDUCTION SYSTEM. A. V. Robnett and E. J. Vulgan. Oct. 3, 1955. 19p. (TM-236-55-51). $0.20(OTS).

A small-scale automatic data reduction system for field use is described. Test data recorded on punch tape in digital Gray code are translated to binary form and decoded to produce analogue representation of test phenomena on standard graph paper. In addition, provision is made for retranscription of data on punch tape in the form of decimal excess-3 code. (auth)

7827 AECU-3138
David Sarnoff Research Center, Princeton, N. J.
ELECTRONIC DEVICES FOR NUCLEAR PHYSICS. Quarterly Report No. 21 [for] August 1, 1955–October 31, 1955. R. H. Anderson, G. O. Fowler, M. H. Greenblatt, and A. H. Sommer. (This report also covers work on photoelectric emission which is not included in the contract, and was done by: A. H. Sommer). 21p. For Oak Ridge National Lab. Contract W-7405-eng-26, Subcontract 308.

Studies associated with the design of high-speed, high-current multiplier design were continued. Results obtained in the study of trajectories in tubes having a central high potential electrode are given, and some of the characteristics of multi-alkali cathode multipliers are discussed. (For preceding period see AECU-3074.) (D.E.B.)

7828 HE-150-127
California. Univ., Berkeley. Inst. of Engineering Research.
FLUID FLOW AND HEAT TRANSFER AT LOW PRESSURES AND TEMPERATURES. RECENT IMPROVEMENTS IN A ROTATING CYLINDER APPARATUS FOR RAREFIED GAS DYNAMICS RESEARCH. Technical Report. James M. Bowyer, Jr. Dec. 28, 1954. 44p. Project NR 061-003. Contract N7-onr-295-Task 3.

7829 IGR-R/CA-173
Gt. Brit. Capenhurst Works, Capenhurst, Ches., England.
RATE OF TEMPERATURE CHANGE RECORDER. W. Jaques. Apr. 4, 1956. 15p.

The cooling characteristics of an alloy at temperatures near its melting point are automatically plotted from the output of similar thermocouples placed in the alloy and the

furnace walls. A printed record is produced of the following measurements: the temperature of the alloy (0-25 mv); the temperature difference between the alloy specimen and the furnace wall (500-0-500 μv); the rate of change of temperature of the alloy (50-0-50 μv in 30 sec). The circuit design, operation, and calibration are described and the causes of errors are analyzed. Some results of measurements are illustrated by typical cooling and heating curves. (auth)

7830 NOLC-318

Naval Ordnance Lab., Corona, Calif.

INERT-ATMOSPHERE CHAMBER FOR CHEMICAL OPERATIONS. D. L. Herring. Jan. 13, 1956. 33p. (NAVORD-4567).

An inert-atmosphere chamber ("dry box") was designed and constructed for handling of nonvolatile chemicals sensitive to moisture and/or oxygen, necessary to research in modified inorganic polymers. The NOLC dry box has been successfully used in operations connected with the synthesis of polymers from metal hydrides, halides, organo-metallic reagents, and so forth. (auth)

7831 NP-5926

Columbia Univ., New York. Columbia Radiation Lab.

RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM. First Quarterly Progress Report for December 16, 1955 through March 15, 1956. P. Kusch, comp. Mar. 15, 1956. 42p. DA Project 3-99-10-022. Contract DA-36-039 SC-64630. (CU-2-56 SC-64630 Phys.)

The performance of the XH1 magnetron as a fundamental oscillator was studied. The low-field operation of magnetrons was studied. Tuning ranges of TRV3 tubes are tabulated, and tuning curves are shown. It was found that a tuning range of 10.2% was obtained for the TRV3-5 magnetron operating at a single fixed magnetic field. The Maser (Microwave Amplification by Stimulated Emission of Radiation) was reconstructed and converted into a two-cavity system. Experimental work was continued on Cherenkov radiation and traveling-wave tubes. The behavior of harmonic generators was determined at high-input powers. A 1N53 harmonic generator was tested and found to perform adequately for most 5- to 6-mm applications. New values, in agreement with previous work, were measured for the $C^{13}-C^{12}$ and $O^{18}-O^{16}$ mass ratios. Improvements were made on the apparatus to study magnetic resonance at mm wave lengths. Work on the microwave spectroscopy of free radicals was continued. Studies of the hyperfine structure of ionized He^3 were continued, and a beam of metastable He^4 ions was produced. (B.J.H.)

7832 OSR-TN-55-383

Laval Univ., Quebec.

PRESSURE TRANSDUCERS AS RECORDING MANOMETERS IN CHEMICAL KINETICS. P. A. Giguère and I. D. Liu. Dec. 1955. 12p. Project N-OSR Chem. 40-6. Contract AF18(600)-492. (AD-83048).

Pressure transducers of the "unbonded strain gage" type are suitable as recording manometers for studying the kinetics of gaseous reactions. Their accuracy and linearity are within ±1% of full scale and their resolution is better than 0.1%. The output (20 to 40 mv) is sufficient to operate directly a recording potentiometer. Models are available in full-scale ranges from 2.5 mm Hg up to several atmospheres. They may be operated at temperatures from −50 to 120°C and can withstand mildly corrosive gases and vapors. Certain precautions are required when the transducers are used as absolute manometers. (auth)

7833 OSR-TN-56-81

Columbia Univ., New York. Electronics Research Labs.

MULTIPOLE SAMPLED-DATA CONTROL SYSTEMS. Technical Report T-12/B. Herbert Freeman. Sept. 30, 1955. 45p. Project No. R-357-50-3. Contract AF 18 (600)-677. (CU-19-55-AF-677-EE; [AD]-81534).

Complex control systems having a multiplicity of interrelated inputs and outputs have plagued the system designer for a long time because of the unwieldy calculations that are involved in their analysis. Synthesis has been practical only by means of simulation studies on an analog computer. This report gives a detailed discussion of a method for eliminating the coupling inherent in such systems in order to permit application of well-known single-input, single-output system techniques. The treatment is from the sampled-data point of view because of the ease with which complicated transfer functions may be realized with a digital computer. The method may, however, be readily extended to continuous-data systems. Limitations of the method are discussed, and an example is given of the design of a controlled for a system having three inputs and two outputs. (auth)

7834 RIA-54-2085

Rock Island Arsenal Lab., Ill.

A PROCEDURE FOR THE USE OF THE PLATINUM RESISTANCE THERMOMETER AS A TEMPERATURE STANDARD. [Report No. 25]. R. L. LeMar. [June 9, 1954]. 20p. Project No. TB5-6010A. (AD-39464).

A detailed procedure was prepared for the use of the Pt resistance thermometer. Various Hg-in-glass thermometers and a Cu−constantan thermocouple were calibrated at temperatures utilized in corrosion preventive work. The procedures are given for the preparation of the galvanometer, galvanometer zero balance, commutator check, and calibration of the thermometer and thermocouple. (auth)

7835 WAPD-STR(C)-168

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

CRUD COLLECTOR. G. B. Rosenblatt, Jr. July 6, 1955. 9p. $1.80(ph OTS); $1.80(mf OTS).

Refined deposition of crud in selected locations is investigated with respect to evaluating the possible methods of crud collection. Several crud removal devices are considered and evaluated. (auth)

7836 AERE-Lib/Trans-670

AN APPARATUS FOR CONTROLLING AND RECORDING THE CIRCULATING LOAD OF A MILL. E. L. Kritskii. Translated by R. D. Lowde from Gornyi Zhur., No. 6, 54(1955). 8p.

7837

PRODUCTION-TYPE VOLATILE METAL FLUORIDE DETECTOR. W. E. Shaw and J. R. Dearwater (National Lead Co. of Ohio, Cincinnati). Ind. Eng. Chem. 48, 792-3 (1956) Apr.

A sensing element for determining the presence of a volatile metallic fluoride in a gas stream was designed to control a process in which a volatile metal fluoride could be converted to a nonvolatile fluoride by reduction with dissociated ammonia. (auth)

7838

AN ATTACHMENT FOR HIGH-TEMPERATURE SINGLE-CRYSTAL X-RAY WORK. L. S. Dent and H. F. W. Taylor (Univ. of Aberdeen). J. Sci. Instr. 33, 89-91(1956) Mar.

This attachment to an x-ray goniometer permits single-crystal or powder photographs to be taken using Cu radiation at up to 900°C. A cylindrical heating element of Ni foil is used, and serves also as a β filter. (auth)

7839

A PRECISION HIGH-TEMPERATURE SPECIMEN CHAMBER FOR AN X-RAY DIFFRACTOMETER. G. K. Williamson and A. Moore (Univ. of Birmingham, England). J. Sci. Instr. 33, 107-10(1956) Mar.

A high-temperature specimen chamber is described in

which continuous gas circulation is employed in heating a specimen 1 in. diameter × 0.020 in. thick to a uniform and accurately known temperature. Using techniques sensitive to 0.1°C no temperature differences could be detected between the centre and periphery of the specimen in the range 20 to 200°C and the difference had a maximum value of less than 1° at 600°C. In practice the true temperature of the specimen can be measured throughout the range 20 to 650°C. Temperature fluctuations due to the control circuit never exceeded ±0.5°C as measured on the specimen. The general reliability of the chamber has been critically examined. Slight modification to the instrument should raise the maximum attainable temperature to approximately 900°C. (auth)

7840

MILLIMICROSECOND COINCIDENCE CIRCUITS. Z. Bay (National Bureau of Standards, Washington, D. C.). Nucleonics 14, No. 4, 56-60(1956) Apr.

The principal coincidence circuits used today are reviewed briefly. These include high-speed Rossi circuits, diode bridges, multiplication circuits, and differential coincidence systems. (B.J.H.)

7841

REACTION CHAMBER FOR ISOTOPIC EXCHANGE REACTIONS. Rowland E. Johnson (Florida State Univ., Tallahassee). Nucleonics 14, No. 4, 96 & 98(1956) Apr.

Designs are given for a reaction chamber which is applicable to many systems and which allows continuous monitoring of the reaction mixture to measure the exchange rate. Preliminary studies were made of Cl^{36} isotopic exchange reaction rates. (B.J.H.)

7842

AN INVESTIGATION OF DEUTERON INDUCED REACTIONS BY MAGNETIC ANALYSIS. I. EXPERIMENTAL TECHNIQUE. T. S. Green and R. Middleton (Univ. of Liverpool, England). Proc. Phys. Soc. (London) A69, 16-27(1956) Jan. 1.

A magnetic spectrograph has been constructed for the measurement of the angular distribution of charged particles emitted in the deuteron bombardment of nuclei. The spectrograph utilizes the focusing properties of an axially symmetrical field and is capable of focusing protons and α-particles of 3 to 18 Mev and deuterons of $1\frac{1}{2}$ to 9 Mev on a 12 in. long photographic plate, with an energy resolution of 0.25%. The instrument has been used in conjunction with the Liverpool 37-in. cyclotron for measurements over an angular range of 5° to 60° at a bombarding energy of 9 Mev. Due to the energy spread of the deuteron beam and the effect of target thickness the total experimental resolution was 0.5 to 0.6%. (auth)

7843

SIMPLE SENSITIVE ELECTRICAL PRESSURE GAUGE. Kenneth M. Sancier and William Richeson (Stanford Research Inst., Calif.). Rev. Sci. Instr. 27, 134-6(1956) Mar.

A simple, sensitive, electrical pressure measurement device has been constructed which is capable of measuring and recording absolute or differential pressures of corrosive materials of isolated systems. A linear variable differential transformer attached to a sylphon bellows indicates differential pressure across the bellows or serves as a null indicator when an unknown pressure on one side of the bellows is balanced with a gas of measurable pressure on the other side. In order to prevent inelastic deformation, the motion of the bellows is limited to 60 mm Hg, although larger pressure differentials can be measured. The sensitivity is independent of temperature and pressure and the device can be compensated for temperature. Absolute pressures and small differential pressures can be measured to ±0.02 mm Hg with an input signal of 2 kc, and to ±0.005 mm Hg with an input signal of 10 kc. A vacuum tube voltmeter with a full scale of 1 millivolt is used as the output indicator. (auth)

7844

DOUBLE-CRYSTAL SPECTROMETER ATTACHMENT TO THE WIDE-RANGE GONIOMETER OF THE NORELCO X-RAY DIFFRACTOMETER. S. R. Maloof (Raytheon Manufacturing Co., Waltham, Mass.). Rev. Sci. Instr. 27, 146-7 (1956) Mar.

The design of a double-crystal spectrometer attachment to the Norelco wide-range goniometer is described. The outstanding features of this design are: (1) the axes of rotation of both crystals are made parallel in the construction of the instrument; (2) one can easily align the instrument in the parallel (n,−n) or antiparallel (n,+n) setting in less than one hour; and (3) no modification of the Norelco equipment is needed, and good use is made of the wide-range goniometer for setting the first crystal at the proper Bragg angle for reflection. Typical parallel position rocking curves for single-crystal Ge and Si are presented. (auth)

7845

ELECTRON-OPTICAL INVESTIGATIONS OF COMPLEX PHOTO-CATHODES. L. N. Bykhovskaya and Yu. M. Kushnir. Zhur. Tekh. Fiz. 25, 2477-85(1955) Dec. (In Russian)

Investigations were undertaken to develop and build a vitreous, unsoldered emission microscope with a resolution of 2 μ and systematic studies were made of integral and spectral sensitivity distributions on surfaces of various complex cathodes. (R.V.J.)

Refer also to abstract 7645.

ISOTOPES

7846 NP-6046

Tennessee. Univ., Knoxville.

INDUSTRIAL APPLICATIONS OF RADIOISOTOPES (thesis). Robert Clyde Kelly. June 1954. 127p.

Problems associated with industrial utilization of radioisotopes, radiation safety, and management consideration are discussed. A review is given of the production and uses of radioisotopes, as radiation sources, as tracers, and in detection instruments for radiation protection. Design and cost data for a radiochemical laboratory to handle radioisotopes are surveyed. (R.V.J.)

7847

ON THE EXCESS FREE ENERGY OF ISOTOPIC MIXTURES. J. Henry. Bull. classe sci., Acad. roy. Belg. 42, No. 2, 163-72(1956). (In French)

The excess free energy of a mixture of isotopes is due to two distinct contributions. This can be seen by supposing that the mixture is done in two separate operations: firstly, the isotopes are mixed at constant volume (constant volume effect), then the volumes are allowed to vary, the pressure being kept constant (volume effect). The volume effect was shown to be positive. I. Prigogine and his coworkers showed that the constant volume part of the free energy is also positive for a lattice of harmonic oscillators. Recently Chester has published a general expression for the constant volume effect and proved that this contribution to the free energy is also positive. In this note Chester's expression for the constant volume term is applied, firstly to a lattice of harmonic oscillators, then to a hard spheres gas. It is shown that in both cases, harmonic and strongly anharmonic systems, the constant volume contribution to the excess free energy is small. This confirms the result of I. Prigogine and his coworkers, that the excess free energy is mainly due to the volume effect for a mixture of light particles at low temperature. (auth)

7848

GAMMA RADIATION FROM THE PROTON BOMBARDMENT

OF BORON TEN. G. B. Chadwick, T. K. Alexander, and J. B. Warren (Cavendish Laboratory, Cambridge, England). Can. J. Phys. 34, 381-8(1956) April.

The gamma rays resulting from the bombardment of B^{10} with protons of energies from 0.5 to 2.0 Mev have been observed with a NaI scintillation counter. Capture radiation, of energy $E_\gamma = 8.81 \pm 0.05 + 10/11\ E_p$ Mev, showed a broad resonance at $E_p = 1135 \pm 15$ kev. At this energy, the radiation had an angular distribution of the form $1 + (0.50 \pm 0.05) \cos^2\theta$ and a total cross section $(3.5 \pm 1.0)10^{-30}$ cm^2. Several lower energy radiations were also observed and assigned tentatively to cascade transitions in C^{11}. The cross section for the 430 kev radiation from the reaction $B^{10}(p,\alpha\gamma)Be^7$ was found to be 0.21 ± 0.05 barn at $E_p = 1.52$ Mev. This radiation was found to be isotropic. (auth)

7849

SULFUR ISOTOPE ABUNDANCES IN SULFIDE MINERALS. J. L. Kulp, W. U. Ault, and H. W. Feely (Lamont Geological Observatory, Palisades, N. Y.). Econ. Geol. 51, 139-49 (1956) Mar.-Apr.

The S^{32}/S^{34} ratios in some 80 samples of hydrothermal, magmatic, and pegmatitic sulfides have been measured. The sulfur isotopic abundances within a deposit appear to be independent of the mineral species (pyrite, marcasite, chalcopyrite, sphalerite, galena, pyrrhotite, bornite, realgar, arsenopyrite, chalcocite), crystal habit, and, possibly, temperature and rate of deposition. The S^{32}/S^{34} ratio does appear related to the source of the sulfur. A high S^{32}/S^{34} ratio indicates a source initially rich in sedimentary sulfide; a low S^{32}/S^{34} ratio suggests a source initially high in sulfate. Most sulfides contain a S^{32}/S^{34} ratio near 22.2, i.e., that of meteoritic sulfur. (auth)

7850

SEARCH FOR TECHNETIUM-98 BY NEUTRON ACTIVATION ANALYSIS. Edward Anders, R. N. Sen Sarma, and P. H. Kato (Univ. of Illinois, Urbana). J. Chem. Phys. 24, 622-4(1956) Mar.

The existence of $Tc^{98}(t^1/_2 > 10^4$ yr) is further confirmed by results of neutron activation of selected minerals. Technetium^{99m} was formed by two processes, decay of Mo^{99} and $Tc^{98}(n, \gamma)$ reaction. (C.W.H.)

7851

NEW SHORT-LIVED ISOTOPES OF TIN FOUND IN FISSION. Alexis C. Pappas and Donald R. Wiles (Univ. of Oslo, Blindern, Norway). J. Inorg. and Nuclear Chem. 2, 69-78(1956) Feb.

A radiochemical method for rapid (45 sec) separation of Sn from fission mixtures has been developed. Tin was separated by extraction of the stannous dithizonate complex into CCl_4 from a tartrate solution adjusted to pH 8.5 to 9.0. The Sb daughters growing in were subsequently isolated by shaking the CCl_4 phase with buffered tartrate solution. Using this procedure, the following new neutron-rich isotopes of Sn have been found: 2.6 ± 0.3-min Sn^{130}, 3.4 ± 0.5-min Sn^{131}, and 2.2 ± 0.3-min Sn^{132}. Improved half-lives are given for Sb^{130} (10.0 ± 0.5 min) and Sb^{132} (2.0 ± 0.2 min). These values have been used to correct previously measured fission yields for the corresponding Sb daughters. The corrected yields are for—10.0-min Sb^{130}, $2.0 \pm 0.5\%$; 23.1-min Sb^{131}, $2.5_6 - 0.2\%$; and for 2.0-min Sb^{132}, ~3%. (auth)

7852

SEARCH FOR POSSIBLE NATURALLY OCCURRING ISOTOPES OF LOW ABUNDANCE. F. A. White, T. L. Collins, and F. M. Rourke (Knolls Atomic Power Lab., Schenectady, N. Y.). Phys. Rev. 101, 1786-91(1956) Mar. 15.

A systematic search has been made for the existence of previously unobserved naturally occurring isotopes of low abundance. A two-stage mass analyzer was employed. With the exception of Ta^{180}, none were found. The improved abundance sensitivity of the two-stage spectrometer, however, allowed determinations of lower experimental "upper limits" to be placed on a large number of isotopes. The elements, sodium, aluminum, scandium, niobium, and cesium were confirmed to be monoisotopic. A comparison has also been made of abundance measurements obtained with this instrument to those obtained in previous investigations. (auth)

ISOTOPE SEPARATION

7853

PREPARATION OF 99.8% NITROGEN-15 BY CHEMICAL EXCHANGE. W. Spindel and T. I. Taylor (Columbia Univ., New York). J. Chem. Phys. 24, 626-7(1956) Mar.

The separation of N^{15} (~99.8%) by utilization of the exchange reaction, $N^{15}O(g) + HN^{14}O_3(aq) \rightleftharpoons N^{14}O(g) + HN^{15}O_3(aq)$ in a two-stage cascade system is reviewed. (C.W.H.)

MASS SPECTROGRAPHY

7854 AERE-Lib/Trans-691

INVESTIGATION OF THE ISOTOPIC COMPOSITION OF LITHIUM. K. Ordzhonikidze and V. Shutse. Translated by S. Botcharsky from Zhur. Eksptl'. i Teoret. Fiz. 29, 479-85(1955). 10p.

Measurements were carried out on the relative abundance of Li isotopes by means of two mass spectrometers. Ions were obtained by evaporation of Li from a tungsten surface or from a Li compound ionized by means of electron beams. There are results of the measurements of the comparative content of Li isotopes in some minerals. The relative abundance ratio of Li isotopes Li^7/Li^6 was determined to be 12.47 ± 0.02. (W.L.H.)

7855

INDUSTRIAL APPLICATIONS (MASS SPECTROMETRY). Clifford E. Berry and J. K. Walker (Consolidated Engineering Corp., Pasadena, Calif.) Ann. Rev. Nuclear Sci. 5, 197-212(1955).

Industrial applications of mass spectrometry to high-molecular weight analysis, continuous analysis of plant samples, and solid analysis are summarized. The automatic reduction of spectral data is discussed. 35 references. (C.W.H.)

7856

MEASUREMENT OF ION MASS BY ELECTRIC FIELD. V. B. Fiks. Doklady Akad. Nauk S.S.S.R. 106, 645-6(1956) Feb. 1. (In Russian)

Measurements of mass of ions with equal energies and the time of their motion along the trajectory are discussed. It is known the non-magnetic mass analyzers work on the principle of a direct or indirect measurement of ion flights along a definite path. Another indirect way of measurement is considered in which ions with equal energies are divided by their mass in an electrostatic field. Mass spectrometers with two elements, a source producing the ions with equal energies, and an analyzing electric field are used for the measuring. Other types of electrostatic analyzers also can be used for analyzing ions by their mass. (R.V.J.)

7857

IMPULSE MASS SPECTROSCOPE. E. I. Agishev and N. I. Ionov. Zhur. Tekh. Fiz. 26, 203-8(1956) Jan. (In Russian)

Results of design modifications developed for mass spectrometers previously described by N. I. Ionov in Zhur. Tekh. Fiz. 23, 2101(1953) are discussed. The improvements increased the resolving power of the spectrometer, made possible the observation of mass spectra on the oscillograph

screen, and by a special construction of the source eliminated the effects of electron beam thickness on the resolving power of the spectrometer. (R.V.J.)

Refer also to abstract 7875.

MATHEMATICS

7858 KAPL-1531
Knolls Atomic Power Lab., Schenectady, N. Y.
ONE-SPACE-DIMENSIONAL MULTIGROUP FOR THE IBM 650. PART II. MACHINE PROGRAM. V. A. Walbran. Apr. 10, 1956. 51p. Contract W-31-109-Eng-52. $0.45(OTS).

The KAPL machine program, PROD II, designed for solution of the one-space-dimension multigroup formulas on the IBM 650 is presented. The general formulas are stated, followed by a discussion of the alternatives provided for in their solution. A complete outline of the program, with flow charts, coding, input preparation and operating instructions is included. (auth)

7859 NM-000-019.02.01
Naval Medical Research Inst., Bethesda, Md.
A LOGICAL COMPUTER. Edward A. Jerome, Thomas J. Connor, and John P. Flynn. Aug. 12, 1955. 34p.

The design of a logical computer of moderate speed is described and the problem of increasing capacity is considered with respect to the number of elementary argument places available, the number of rules accommodated, and the searching time. The device described has 12 elementary argument places divided into 3 groups and a feedback control designed to improve its searching efficiency. A building block design has been used throughout so that apparatus can be enlarged easily and the design, with respect to any of its parts, can be easily changed. It is expected that devices of this nature will eventually perform a function in theory analysis and construction analogous to that served by the desk computer in connection with statistical analysis and general numerical computation. It also seems quite likely that machines of this type will ultimately serve as controls for external electronic equipment of almost any kind. (auth)

7860 NP-5938
[Joint Establishment for Nuclear Energy Research, Kjeller, Norway.]
ON THE SOLUTION OF INTEGRAL EQUATIONS BY MONTE-CARLO METHODS. Kristen Nygaard. Feb. 15, 1952. 10p.

7861 NACA-TM-1403
ON THE INSTABILITY OF METHODS FOR THE INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS. (Über die Instabilitat von Methoden zur Integration gewöhnlicher Differentialgleichungen). Heinz Rutishauser. Translated by Mary L. Mahler from Z. angew. Math. u. Phys. 3, 65-74 (1952). 15p.

In the numerical solution of a differential equation as a difference equation, the latter is usually of higher order and therefore has more solutions than the original differential equation. It may well be that some of these "extra" solutions grow faster than any solution of the given equation; in this case computational solution has the tendency to follow one of these and has after a certain number of integration steps nothing to do with the original differential equation. Some examples and a criterion for stability of integration methods are given. This criterion is then applied to some well-known integration formulas. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

7862 AD-45985
Princeton Univ., N. J.
A NEW METHOD FOR MOUNTING SAMPLES FOR POWDER X-RAY SPECTROMETRY. Technical Report No. 1. H. B. Holland, W. B. Head, III., G. G. Witter, Jr., and G. B. Hess. June 5, 1954. 12p. Contract Nonr 250(00). (PU-250/TR-1).

A method for mounting samples of zircon for use in a Norelco High Angle X-ray Spectrometer corrected the errors in the measurement of 2θ from the order of 0.01 to 0.02°, in the same material, to 0.003°. (F.S.)

7863 AD-46881
Tracerlab, Inc., Boston.
NEUTRON SURVEY EQUIPMENT. Interim Engineering Report on Phase II. R. Bersin. Jan. 1954. 11p. Contract NObsr-57440, Task 19.

Parameters of a methane proportional counter that provides the major part of the instrument response to neutrons above 1 Mev in energy are evaluated establishing conditions for the design of the electronic components. (F.S.)

7864 AERE-HP/M-70
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
COUNTING EFFICIENCIES OF PROBES FOR THE MEASUREMENT OF SURFACE CONTAMINATION. R. C. Chadwick. May 18, 1954. 9p.

7865 AERE-N/M-76
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
NEUTRON DETECTORS FOR THE HARWELL FAST CHOPPER. K. P. Nicholson and J. W. Hall. Mar. 26, 1956. 18p.

The criteria by which a detector is assessed for use with a neutron time of flight spectrometer are surveyed with particular reference to the requirements of the Harwell Fast Chopper. The properties of BF_3 gas filled counters and various types of neutron scintillation counters are discussed and compared with the above requirements. Most of the experimental details were obtained directly by setting up the detectors on the machine. It was found that the most suitable detector is either the $B_2O_3-ZnS(Ag)$ fused disc scintillator or a bank of small diameter BF_3 proportional counters. The other scintillation detectors proved to be unsuitable because of their high sensitivity to background gamma radiation. (auth)

7866 CRLR-561
Chemical and Radiological Labs., Army Chemical Center, Md.
ABSOLUTE BETA MEASUREMENT OF MIXED NUCLIDES (U). Interim Report. For January 1955–March 1955. Fletcher Gabbard, Arnold Berman, and David L. Rigotti. Dec. 2, 1955. 24p. Project 4-12-10-007-02.

The applicability and efficiency of an absolute beta counting system for sources composed of mixed radionuclides is described. It includes a description of the physical setup necessary for such a study, a comparison of results with the theoretical results of standard sources, and a discussion of the problem of self-absorption and self-scattering in the sample. (auth)

7867 CRLR-607
Chemical and Radiological Labs., Army Chemical Center, Md.
APPLICATION OF RECIPROCITY TO GAMMA-RAY SHIELDING STUDIES. Special Report covering period May 1955 to October 1955. Ralph R. Fullwood and Donald

R. Roberts. Dec. 2, 1955. 19p. Project 4-12-10-007-04.

The attenuation of gamma radiation by common structures is studied on the basis of reciprocating source and detector, and the solution for an infinite plane field of radiation outside of the structures is obtained by using the observation point as an influence function. The attenuation of three buildings is obtained under conventional and reciprocal techniques. Suggestions for the improvement of the agreement between the two techniques are made and the advantages of the reciprocal technique are discussed. (auth)

7868 IGO-AM/W-38

Gt. Brit. Windscale Works, Sellafield, Cumb., England.
COUNTING THE TOTAL BETA-ACTIVITY OF GRANULAR AREA SURVEY SAMPLES USING AN END-WINDOW G. M. COUNTER. W. R. Diggle and L. P. O'Connor. June 15, 1956. 7p.

The total β activity of the granular sample is measured by means of a stable end-window G. M. Counter. The activity of the sample is expressed as K disintegration giving rise to β radiation by reference to a standard K source. (auth)

7869 MLM-884

Mound Lab., Miamisburg, Ohio.
MOUNTING TECHNIQUES FOR THE ASSAY OF RADIOACTIVITY. J. J. Dauby. Jan. 20, 1953. Changed from OFFICIAL USE ONLY June 25, 1956. 19p. Contract AT-33-1-GEN-53. $3.30(ph OTS); $2.40(mf OTS).

Radioactive assay methods are reviewed with a detailed discussion of the dilution and mounting procedure. General rules to be followed for sample preparation and for choice of proper laboratory equipment and counting instruments are given. This report is issued primarily as a guide for chemists at Mound Laboratory, but some of the techniques described may be of interest to others who may have occasion to work with these materials. (auth)

7870 NM 006 012.04.92

Naval Medical Research Inst., Bethesda, Md.
RADIATION DOSIMETRY IN BIOLOGICAL RESEARCH. J. E. Morgan and F. Ellinger. Dec. 9, 1955. 18p.

Some special physical problems and techniques involved in the measurement and delivery of precisely standardized doses of x and γ radiation are discussed. The fact that a higher order of dosimetric accuracy is essential for radiobiological laboratory experiments than for routine clinical therapy is emphasized. Difficulties in extending application of the roentgen unit to higher photon energies, some mechanical and electrical inadequacies found in commercial x ray and dosimetric equipment, and marked improvements obtained by the use of relatively simple accessories are reported. Special reference is made to the unusual problems encountered in operating a 2,400 c Co^{60} irradiator of spherical configuration. (auth)

7871 NP-5924

El-Tronics, Inc., Philadelphia.
DEVELOPMENT OF RADIACMETERS IM-108(XE-1)/PD AND IM-108(XE-2)/PD. Final Progress Report and Cost Engineering Analysis from March 1954 to April 1955. J. M. Johnston. 35p. Project 213A. Contract DA36-039-SC-56771.

Contracts were let for the design and construction of radiation detection instruments for Army use. Fifty each of two models were designed, constructed, and tested in accordance with Signal Corp specifications in the range 0.05 to 500r. The specifications, design, bill of materials, and a cost breakdown are given. (D.E.B.)

7872 NRL-4706

Naval Research Lab., Washington, D. C.
A PULSED-LIGHT READER FOR THE DT-60 GLASS DOSIMETER. Justin C. Schaffert. Feb. 1, 1956. 14p. Project Nos. NR-623-010 and NE-051-551.

Design of a pulsed-light reader for use with the Ag-activated phosphate-glass DT-60 γ dosimeter is described. The self-powered instrument is lightweight and compact. Preliminary tests indicate reliable performance under field conditions. (C.H.)

7873 UCRL-3411

California. Univ., Berkeley. Radiation Lab.
A DOUBLE-PULSE TOTAL-ABSORPTION SPECTROMETER FOR NEUTRONS (thesis). John W. McCord. May 11, 1956. 30p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

Submitted to the United States Naval Postgraduate School, Monterey, Calif.

A neutron spectrometer has been constructed consisting of a phototube viewing a plastic scintillator that is surrounded by a BF_3 proportional counter. When a neutron produces a recoil in the plastic scintillator and this neutron is subsequently captured in the BF_3 counter, a gate is formed by this delayed coincidence which allows the height of the first plastic scintillator pulse to be analyzed by a pulse-height analyzer. During this delay time the first pulse has been stored in a delay line while the associated neutron has become thermalized and captured. The spectrometer is essentially nondirectional, and from experimental evidence its lower limit of response appears to be ~3 Mev, with the upper limit (not yet investigated) probably extending as high as 15 Mev. Spectra of Po–Be and Mock Fission sources are included. Monoenergetic neutrons from $d(d,n)He^3$ and $T(d,n)He^4$ reactions were used to calibrate the counter. An interpretation of these results is given. (auth)

7874 UR-453

Rochester, N. Y. Univ. Atomic Energy Project.
THE CARBON ARC IMAGE FURNACE. T. P. Davis. June 20, 1956. 20p. Contract W-7401-eng-49. $3.30(ph OTS); $2.40(mf OTS).

High current carbon arc as primary source of radiation and the problems of utilizing this source in an image-type furnace are discussed. Various optical and controlling systems of operating sources are described and compared, and the areas of possible improvement noted. (auth)

7875 Y-1134

Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.
AN IMPROVED ION SOURCE FOR MASS SPECTROMETRIC ANALYSIS OF SOLIDS. Chester R. Fultz. May 10, 1956. 12p. Contract W-7405-eng-26. $0.15(OTS).

An improved mass spectrometer ion source for the isotopic analysis of solid samples is described. The source was designed to permit rapid replacement of the sample and can be operated up to 600°C. (auth)

7876 AERE-Lib/Trans-656

RESOLVING POWER OF SCINTILLATION SPECTROMETERS. I. F. Barchuk, E. M. Galkin, M. V. Pasechnik, and N. N. Pucherov. Translated by R. C. Murray from Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 19, 352-4(1955). 5p.

An abstract of this paper appears in Nuclear Science Abstracts as 10-253. (L.M.T.)

7877

LIQUID SCINTILLATION TECHNIQUE FOR MEASURING CARBON-14 DIOXIDE ACTIVITY. John M. Passmann, Norman S. Radin, and John A. D. Cooper (V. A. Research Hospital and Northwestern Univ. Medical School, Chicago). Anal. Chem. 28, 484-6(1956) Apr.

A method is described for the determination of C^{14} in large amounts of CO_2 using a liquid scintillation counter. The CO_2 is dissolved in a toluene–methanol counting medium

by diffusing it into a solution of a high molecular weight quaternary ammonium hydroxide. The efficiency of counting is independent of the amount of CO_2, but does depend on the amount of amine. The efficiency ranges from 33% to greater than 67%. (auth)

7878

VARIATIONS OF THE LATENT IMAGE DURING THE TIME INTERVAL WHICH PRECEDES DEVELOPMENT. III. EXPERIMENTAL RESULTS BASED ON DENSITY VARIATION. María Teresa Vigón and María Angela de la Vega. Anales real soc. españ. fis. y quim. (Madrid), Ser. A 52A, 11-26(1956) Jan.Feb. (In Spanish)

In a previous paper, the variations of the latent image have been satisfactorily explained because of a redistribution process which tends to the equilibrium. An equation which relates the density variations and the time between the exposure and the development has been found. That relation is in agreement with the facts described in the literature and leads to conclusions relating the influence of certain factors on the observed density variation. These conclusions have been experimentally proved in this communication and its agreement with the theoretical hypothesis is discussed. (auth)

7879

CONTRIBUTION TO THE STUDY OF SOME EXCITED STATES OF HEAVY NUCLEI BY MEANS OF EMULSIONS SENSITIVE TO INDIVIDUAL ELECTRON TRAJECTORIES. Georgette Albouy. Ann. phys. (13) 1, 99-151(1956) Jan.-Feb. (In French)

Discussions are included on the fading of latent images in nuclear emulsions and on experimental techniques using nuclear emulsions. These techniques were used to study the $Pu^{239} \rightarrow U^{235}$, $U^{233} \rightarrow Th^{229}$, and $Pa^{231} \rightarrow Ac^{227}$ transitions. A study of the excited states of even-even nuclei is also discussed. (B.J.H.)

7880

NUCLEAR PARTICLE DETECTION (CLOUD CHAMBERS AND BUBBLE CHAMBERS). William B. Fretter (Univ. of California, Berkeley). Ann. Rev. Nuclear Sci. 5, 145-78 (1955).

The theory, design, and applications of expansion cloud chambers, diffusion cloud chambers, and bubble chambers are described. 92 references. (C.W.H.)

7881

SMALL END-WINDOW AND ANGLE-WINDOW GEIGER COUNTERS. MEASUREMENT OF RADIOACTIVITY IN INTRAOCULAR TUMORS FOLLOWING INJECTION OF RADIOACTIVE PHOSPHORUS. Charles I. Thomas, Jack S. Krohmer, William J. MacIntyre, and Mary Bovington (Western Reserve Univ. School of Medicine and Univ. Hospitals, Cleveland). Arch. Ophthalmol. 55, 519-21(1956) Apr.

7882

WEDGE FILTERS FOR USE WITH A 100-CURIE COBALT 60 TELETHERAPY UNIT. T. J. Tulley (Radiotherapy Centre of the Royal Infirmary, Hull). Brit. J. Radiol. 29, 227-9 (1956) April.

The construction and measurement of wedge filters for use with a 100-c Co^{60} teletherapy unit are described and general principles of their design are discussed. (C.H.)

7883

ON THE USE OF CYCLOPROPANE AS A SELF-QUENCHING GAS FOR FILLING GEIGER COUNTERS. Jacques-Paul Vigne. Compt. rend. 242, 1879-80(1956) Apr. 9. (In French)

Filling Geiger counters with a mixture of 10% pure cyclopropane and 90% A under a total pressure of 100 mm Hg improves their properties (starting threshold, slope, dead time, recovery time, pulse amplitudes) and allows the introduction of a considerable quantity of CO_2 without modifying their performance. (tr-auth)

7884

CALCULATION OF RESOLVING CURVES FOR COINCIDENCE SYSTEMS USING SCINTILLATION DETECTORS. Louis Dick, Roger Foucher, Nils Perrin, and Hamlet Vartapetian. Compt. rend. 242, 1880-3(1956) Apr. 9. (In French)

Taking account of the probabilities of appearance of the first photoelectron and of the fluctuations of the photomultiplier and the electronics, resolution curves are calculated for a delayed coincidence system. (tr-auth)

7885

A NEW SCINTI-SCANNER. W. Bolliger and G. G. Poretti. Experientia 12, 116-17(1956) Mar. (In German)

An apparatus for automatic scanning of radioactive parts of the body is described (scinti scanner). A lead protected scintillation counter is moved over the organ to be examined. The registered impulses are recorded on a special paper with a writing mechanism rigidly fixed with the counter. Three scanning sizes, scanning speeds and ray collimators are provided. The measuring time varies between 4 min and 4 hr. Measurements are mainly done with I^{131} (inorganic or linked to serum albumine or di-iodofluorescein) and Au^{198}. (auth)

7886

CHEMICAL ASPECTS OF THE GEIGER-MÜLLER DISCHARGE. I. THE ETHANOL-ARGON COUNTER. Robert W. Kiser and W. H. Johnston (Purdue Univ., Lafayette, Ind.). J. Am. Chem. Soc. 78, 707-9(1956) Feb. 20.

The decomposition of the ethanol quench gas by the Geiger-Müller discharge in an ethanol-argon counter was investigated mass spectrometrically. The decomposition was first order with a decomposition constant of 8.55×10^{-6} per pulse, corresponding to an initial rate of 359 molecules of ethanol destroyed per electron passed. This large effective electron yield suggests the primary mechanism is electron collision in the gas phase. (auth)

7887

KINETICS OF LUMINESCENCE QUENCHING IN LIQUID SCINTILLATORS. B. Lionel Funt and Edward Neparko (Univ. of Manitoba, Winnipeg, Canada). J. Phys. Chem. 60, 267-9(1956) Mar.

The kinetics of luminescence quenching in liquid scintillator solutions containing dissolved O_2 have been studied. A mechanism is postulated which is in good agreement with the experimental data for the 8 systems reported. The experimental rate constants have been compared with rates of collision obtained from simple kinetic theory. Such a comparison indicates an extremely efficient collisional mechanism with almost every collision effectively deactivating the solute molecule. (auth)

7888

SOME NOTES ON THE DESIGN AND PERFORMANCE OF X-RAY PROPORTIONAL COUNTERS. A. R. Lang (Cavendish Lab., Cambridge, England). J. Sci. Instr. 33, 96-102(1956) Mar.

For proportional counting of x-ray wavelengths used in diffraction, Xe is the best counter gas, Kr the least suitable. A small, high-efficiency, low-background, Xe-filled counter is described. A and Xe counters containing about 10% ethylene operate stably with 50,000-fold multiplication of CuKα ionization, but for undistorted pulse-height distributions at counting rates greater than 10,000 per second multiplication should not be greater than a few thousand. Diffraction pattern background intensity of light elements, such as Al, is reduced to ½ to ⅔ of the value as registered by a Geiger counter. (auth)

7889
A SIMPLE FAST-RECYCLING CLOUD CHAMBER. J. Walker, G. Tagliaferri, J. C. Bower, and D. W. Hadley (Univ. of Birmingham, England). J. Sci. Instr. 33, 113-15 (1956) Mar.

A simple modification to a standard 9-in. diameter expansion chamber is described which decreases the operating cycle from 60 to 10 sec. Over-compression is used and the results obtained from different operating conditions throw some light on the mechanism of the process. (auth)

7890
A PERSONAL γ-RADIATION MONITOR WITH AUDIBLE WARNING DEVICE. D. Allenden and I. W. Collip (Associated Electrical Industries, Ltd., Aldermaston, Berks, England). J. Sci. Instr. 33, 120-2(1956) Mar.

A prototype personal γ radiation monitor is described which uses an electrometer tube and transistor alarm circuit to give an audible warning to the wearer on receipt of a tolerance dose of γ radiation. The insulation requirements of the tube and chamber circuits and the design of the alarm circuits are discussed, particular attention being paid to ease of checking and "fail-safe" features. It is concluded that the desired performance is consistently realizable in the design presented, a dosage accuracy of the order of ±5% being achieved. (auth)

7891
GASEOUS SCINTILLATION COUNTING. C. Eggler and C. M. Huddleston (Argonne National Lab., Lemont, Ill.). Nucleonics 14, No. 4, 34-6(1956) Apr.

The mechanisms and problems involved in gaseous scintillation counting techniques are briefly discussed. The major advantages of this counting technique are the faster pulses and nearly complete insensitivity to γ rays. (B.J.H.)

7892
LOS ALAMOS GAS COUNTERS. John A. Northop and Ralph Nobles (Los Alamos Scientific Lab., N. Mex.). Nucleonics 14, No. 4, 36-7(1956) Apr.

Results of studies on gas scintillation counters, particularly those using Xe, are summarized. It was found that the gas contamination problem can be met by continuous purification. The gas purifier consisted of a metal bellows and valve system which provided uniform gas flow into a furnace containing U turnings at 800°C. Data are also given which show that gaseous scintillators are linear with energy and that they are fast and efficient. The counting properties of liquid and solid Xe are also briefly discussed. (B.J.H.)

7893
NEUTRON SCINTILLATION COUNTERS. C. O. Muehlhause (Brookhaven National Lab., Upton, N. Y.). Nucleonics 14, No. 4, 38-9(1956) Apr.

A table is given which enumerates existing types of neutron scintillation counters and compares their principle characteristics. (B.J.H.)

7894
REDUCTION OF NaI BACKGROUND. C. E. Miller, L. D. Marinelli, R. E. Rowland, and J. E. Rose (Argonne National Lab., Lemont, Ill.). Nucleonics 14, No. 4, 40-3(1956) Apr.

Work which has been done on the reduction of background counting rates of scintillation crystals is summarized. Designs are given for an 8- × 8- × 6-ft room of stainless steel which is used as a main shield, and data are given on the resultant background reduction. Background effects due to photomultiplier radioactivity, residual counts, airborne radioactivity, and electronics are also discussed. (B.J.H.)

7895
HIGH-ENERGY CERENKOV COUNTER. C. E. Swartz (Brookhaven National Lab., Upton, N. Y.). Nucleonics 14, No. 4, 44(1956) Apr.

Descriptions are given of a high-energy Cherenkov counter employing a 16-in. DuMont photomultiplier looking at a 290-lb cylinder-pair of Corning glass 12 in. in diameter and 14 in. long. (B.J.H.)

7896
BETTER CABLE FOR COUNTER EXPERIMENTS. Quentin A. Kerns (Univ. of California, Berkeley). Nucleonics 14, 45(1956) Apr.

An investigation was made of pulse distortion in various cables, and results are presented in graphical form. The use of Styrofoam transmission line in counter experiments is discussed in more detail. (B.J.H.)

7897
TOWARDS BETTER SCINTILLATION COUNTING. Nucleonics 14, No. 4, 46-7(1956) Apr.

The limitations of scintillator resolution, the phosphorescence in glass photomultiplier envelopes, and the temperature dependence of photomultiplier gain are briefly discussed. (B.J.H.)

7898
LIQUID SCINTILLATORS WITH HEAVY ELEMENTS. Hartmut P. Kallmann, Milton Furst, and Felix H. Brown (New York Univ., N. Y.). Nucleonics 14, No. 4, 48(1956) Apr.

A discussion is given of the use of naphthalene, biphenyl, and other such compounds in the area of liquid scintillation counting techniques in which radioactive materials are put directly into the solution. Data on the γ-ray fluorescence of solutions containing various metal salts are tabulated. (B.J.H.)

7899
LIQUID-SCINTILLATOR TEMPERATURE EFFECTS. H. H. Seliger and C. A. Ziegler (National Bureau of Standards, Washington, D. C.). Nucleonics 14, No. 4, 49(1956) Apr.

Temperature effects of photomultiplier tube response and of liquid scintillator response were investigated. It was found that DuMont 6292 and RCA 5819 photomultipliers show a slight decrease in response with decreasing temperature and that the light outputs of liquid scintillators of DPO, PBD, and α-NPO dissolved in xylene increased markedly with decreasing temperature. (B.J.H.)

7900
SPECTRUM AND DECAY OF NaI. Wesley Van Sciver (Levinthal Electronic Products, Inc., Redwood City, Calif.). Nucleonics 14, No. 4, 50-1(1956) Apr.

The luminescence spectra from unactivated and Tl-activated NaI crystals were measured in the temperature range -190°C to +20°C using α particles, γ rays, and ultraviolet light as sources of excitation. Emission curves from Co^{60} -excited crystals are given. (B.J.H.)

7901
HOW MUCH DO CERENKOV COUNTERS SCINTILLATE? Richard Madey and Lawrence Leipuner (Brookhaven National Lab., Upton, N. Y.). Nucleonics 14, No. 4, 51(1956) Apr.

The relative scintillation light outputs of various Cherenkov media are tabulated. (B.J.H.)

7902
PEAK EFFICIENCY OF NaI. N. H. Lazar, R. C. Davis, and P. R. Bell (Oak Ridge National Lab., Tenn.). Nucleonics 14, No. 4, 52(1956) Apr.

Curves are given for the peak efficiency of a NaI crystal as a function of γ energy in the region between 0 and 10 Mev. (B.J.H.)

7903
INTRINSIC SCINTILLATOR RESOLUTION. G. G. Kelley, P. R. Bell, R. C. Davis, and N. H. Lazar (Oak Ridge National Lab., Tenn.). Nucleonics 14, No. 4, 53(1956) Apr.

Evidence for intrinsic scintillator resolution was obtained

by comparison of the line width from an artificial light flash to NaI line widths for various photomultipliers. Resultant data are tabulated. (B.J.H.)

7904

TODAY'S PULSE-HEIGHT ANALYZERS. W. A. Higinbothan (Brookhaven National Lab., Upton, N. Y.). Nucleonics 14, No. 4, 61-4(1956) Apr.

The currently used methods of pulse height analysis are briefly surveyed. Discussions are given of single-channel analyzers, multichannel analyzers, and Wilkinson-type analyzers. Methods of data accumulation and some uses of analyzers are also reviewed. (B.J.H.)

7905

HYDROGEN COUNTER FOR ANALYSIS OF DILUTE TRITIUM OXIDE. J. W. Healy and L. C. Schwendiman (General Electric Company, Richland, Washington). Radiation Research 4, 278-85(1956) April.

7906

ANALYSIS OF MIXTURES OF RADIOACTIVE ISOTOPES BY γ-RAY MEASUREMENTS. APPLICATION OF THE METHOD TO Ac^{227}, Th^{227}, and Ra^{223}. D. S. Anthony, J. E. Campbell, G. R. Hagee, and E. S. Robajdek (Monsanto Chemical Company, Miamisburg, Ohio). Radiation Research 4, 286-93(1956) April.

A general method for the determination of the components of a mixture of radioactive isotopes by measurement of the growth and/or decay of γ-ray emission is described. Application of the method to the determination of Ac^{227}, Th^{227}, and Ra^{223} in mixtures is described step by step. The method automatically compensates for differences in the γ-ray energy spectrum of the nuclei measured, requires almost no sample preparation, and is applicable to an enormous range of physical or chemical forms of sample. Sensitivity is sufficient for determination of 10^{-2} μc or less of γ-ray emitting isotopes. (auth)

7907

HIGH-ENERGY NEUTRON DETECTORS EMPLOYING LIQUID SCINTILLATORS. E. R. Christie, B. T. Feld, A. C. Odian, P. C. Stein, and A. Wattenberg (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 27, 127-31 (1956) Mar.

Two liquid scintillation type neutron detectors with efficiencies of the order of 5% for counting 130-Mev neutrons have been studied. A fairly monoenergetic source of neutrons was obtained from the photodisintegration of deuterons. Estimates were made of the efficiencies of the counters as a function of bias. Experiments indicate: (1) an appreciable effect of the products of neutron reactions with carbon; (2) the efficiency can be more accurately predicted for a small counter although the behavior of large counters can be qualitatively predicted; (3) the attenuation due to a lead shield in the beam depends upon the neutron energy, the bias, and the geometry; (4) lead shielding on the sides is relatively unimportant if kept thin. (auth)

7908

SCINTILLATION SPECTROMETRY USING LONG LIGHT GUIDES. P. A. Tove (Univ. of Uppsala, Sweden). Rev. Sci. Instr. 27, 143-6(1956) Mar.

The attenuation of different types of light guides used with scintillation counters has been measured. The detrimental effect of the guides in scintillation spectrometry has been studied. (auth)

7909

HIGH-SPEED SCALING WITH A DECADE-COUNTER TUBE. D. I. Porat (Weizmann Inst. of Science, Rehovoth, Israel). Rev. Sci. Instr. 27, 150-2(1956) Mar.

A E1T decade-counter tube is used in conjunction with an energy-storage counting circuit. The stray capacitance at the anode of the decade tube serves as the energy storage element, while the stabilizing characteristic of the tube itself makes the circuit completely aperiodic. A secondary-emission tube, type EFP60, produces a 0.15-μsec high current pulse for resetting the decade counter to zero at each tenth input pulse. Double-pulse resolution of <1μsec and a continuous rate of above 10^8 pps have been achieved. (auth)

7910

TECHNIQUES OF MEASURING NEUTRON SPECTRA WITH THRESHOLD DETECTORS—TIME DOSAGE DETERMINATION. G. S. Hurst, J. A. Harter, P. N. Hensley, W. A. Mills, M. Slater, and P. W. Reinhardt (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 27, 153-6(1956) Mar.

A method is described for measuring the spectrum of fast neutrons with a series of foil detectors. The detectors consist of Au and Au plus Cd for determining the thermal flux, Pu^{239} shielded with B^{10} for determining the total fast flux, Np^{237} for determining the total flux above 0.75 Mev, U^{238} for determining the total flux above 1.5 Mev, and S^{32} for determining the total flux above 2.5 Mev. From these data the spectrum of fast neutrons can be constructed reasonably well for spectra similar to that of fission. The amount of induced activity in the detecting elements is determined with scintillation counters, which are calibrated by irradiation of suitable foils with thermal neutrons. Fast neutron tissue dose can be calculated from the measured spectrum. Since the foil method of measuring spectra works well for high intensity bursts of neutrons, dosimetry may be accomplished under conditions where other methods, e.g., the ionization chamber and proportional counter, would lead to questionable data. (auth)

7911

IMPROVED MONOCHROMATOR FOR DIFFUSE X-RAY SCATTERING MEASUREMENTS. D. R. Chipman (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 27, 164-5(1956) Mar.

A close approximation to a doubly bent crystal monochromator is obtained by pressing a large number of narrow strips in a doubly concave form. Details of construction are given. For measurements of diffuse scattering from a single crystal the monochromator gives 40 times the intensity of a singly bent crystal for the same volume element in reciprocal space. (auth)

7912

TIME-TO-PULSE-HEIGHT CONVERTER FOR MEASUREMENT OF MILLIMICROSECOND TIME INTERVALS. W. Weber, C. W. Johnstone, and L. Cranberg (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 27, 166-70(1956) Mar.

A circuit is described which is designed to measure the time elapsed between a fast-rising signal from a nuclear detector and the next pulse from a steady source of pulses which are evenly spaced in time and occur at an rf rate. This circuit has been found useful for measuring time intervals in the millimicrosecond range as part of a system of fast-neutron spectrometry which utilizes a pulsed source of neutrons. The conversion of time to pulse height is linear for time intervals from 10mμsec to a time which is 20 mμsec shorter than the interval between the rf pulses. The resolution obtainable depends on the characteristics of the detector. The precision of time measurement is about 1 mμsec. (auth)

7913

PREPARATION OF THIN LIGHT-TIGHT WINDOWS FOR SCINTILLATION COUNTERS. W. Franzen (Univ. of Rochester, N. Y.) and L. Schellenberg (Physikalisches Institut der Universitat, Basel, Switzerland). Rev. Sci. Instr. 27, 171(1956) Mar.

A method for preparing Al foils of $\approx$50 μg/cm^2 is given. (D.E.B.)

7914
REVERSED-POTENTIAL HALOGEN-QUENCHED COUNTERS. Walter G. Egan (New York Naval Shipyard, Brooklyn). Rev. Sci. Instr. 27, 172(1956) Mar.

Halogen-quenched G-M tubes may be operated with reversed potential, with greatly decreased sensitivity. Sensitivity-potential traces for reversed potential operation show a continuous slope, replacing the usual plateau. (D.E.B.)

7915
MODIFICATION TO THE AUTOMATIC IONIZATION CHAMBER. H. V. Neher and Alan R. Johnston (California Inst. of Tech., Pasadena). Rev. Sci. Instr. 27, 173-4(1956) Mar.

Inserting a metal conductor inside the outer conductor surrounding the quartz fiber in the automatic ionization chamber eliminates the dependency of discharge time on fiber potential. (D.E.B.)

7916
NEW ROENTGEN CHAMBERS FOR INVESTIGATION OF THIN STRUCTURES OF POLYCRYSTALLINE MATERIALS. S. O. Tsobkallo. Zhur. Tekh. Fiz. 26, 213-19(1956) Jan. (In Russian)

Roentgen chambers intended for measuring the width and intensity of large number of roentgen lines are discussed. A special calibrating device installed in the chamber records isolated lines on the film. Advantages of the new types of chambers compared with other types are described. (R.V.J.)

Refer also to abstracts 7682 and 7803.

MESONS

7917
MESONS AND HYPERONS. Maurice M. Shapiro (Naval Research Lab., Washington, D. C.). Am. J. Phys. 24, 196-204(1956) Apr.

Basic properties of L-mesons, K-mesons, and hyperons are summarized in the light of evidence available in mid-1955. Masses, decay schemes, lifetimes, and Q-values are tabulated. The accompanying notes described how "best values" were arrived at, and serve as a guide to a representative selection of references on unstable particles. (auth)

7918
THE RELATIONSHIP BETWEEN THE STATISTICAL AND FIELD THEORETICAL TREATMENTS OF MULTIPLE MESON PRODUCTION. Yasushi Takahashi (State University of Iowa, Iowa City, Iowa). Can. J. Phys. 34, 378-80(1956) April.

7919
OBSERVATION OF HYPERFRAGMENTS. Louis Leprince-Ringuet, Jean Crussand, Violette Fouche, James Hennessy, Georges Kayas, Daniel Morellet, and Francoise Renard. Compt. rend. 242, 1554-7(1956) Mar. 19. (In French)

Remarks are made concerning the hyperfragments observed in plates exposed to the 6.2-Mev proton beam at Berkeley and to high altitude cosmic radiation. Some of the characteristics of the hyperfragment decays are summarized. (B.J.H.)

7920
ON DEDUCTIONS OF CROSS SECTION RELATIONS BASED ON THE HYPOTHESIS OF ISOTOPIC INVARIANCES. N. Dushin, and I. Shmushkevich. Doklady Akad. Nauk S.S.S.R. 106 801-4(1956) Feb. 11. (In Russian)

A simple method of cross section correlations based on hypothesis of isotopic invariance has been presented previously. An attempt is made to show that with slight variations the method can be applied to obtain additional correlations not previously considered. π-Meson collisions with nucleons resulting in formation of two π-meson particles are investigated. In the investigation it was assumed that the target has an even number of protons and neutrons, and the beam has an even number of π^+, π^-, and π^0 mesons. It was observed that only one correlation fitted the π-meson scattering by nucleons and the elastic scattering of π mesons by deuterons. (R.V.J.)

7921
STATISTICAL ESTIMATION OF THE ENERGY OF PARTICLES GENERATING ELECTRON-NUCLEON SHOWERS. E. M. Fridlender (Bukharest Inst. of Physics). Doklady Akad. Nauk S.S.S.R. 106, 826-9(1956) Feb. 11. (In Russian)

A new statistical method is offered to evaluate the energy ϵ of the initial particle generating electron-nucleon showers. To date no objective evaluation of this value has been proposed. The analysis of the angular distribution of shower particles gives only the velocity of the center-mass, which is connected to the energy of the initial particle ϵ, and which, also depends on the number of the target-source nucleons participating in a collision. The evaluation of ϵ based on the electron-nucleon shower soft component depends upon certain assumed evaluations of the π^0/π^+ ratio as well as on the ratio of the number of π mesons to the number of all-shower particles. The difficulty for the interpretation of the separate collisions lead to the development of the statistical method. The preliminary results indicate that the proposed method may be applied not only for π mesons but for any strongly interacting, unstable particles as well as for high-energy short-lived particles in fast Bev accelerators. (R.V.J.)

7922
ON RELATION BETWEEN CROSS SECTIONS IN MULTIPLE FORMATION OF π MESONS. N. V. Dushin (Kalinin Polytechnical Inst.). Doklady Akad. Nauk S.S.S.R. 106, 977-80 (1956) Feb. 21. (In Russian)

The hypothesis of isotopic invariability enables one to obtain the relation between the cross sections of the multiple formation of π mesons formed in collisions of π mesons and nucleons with nucleons. A series of additional relations which occur at the threshold of the investigated processes are discussed. (R.V.J.)

7923
ANALYSIS OF SOME CASES OF θ^0-PARTICLE ABNORMAL DECAY. E. Fridlender. (Bukharest Inst. of Physics). Doklady Akad. Nauk S.S.S.R. 106, 989-90(1956) Feb. 21. (In Russian)

Studies of many scientists indicated that θ^0-particle mass is close to τ-meson mass($975m_e$). Nevertheless, from time to time statements appear about the "abnormal" θ^0 decay which, in most cases, is described by a Q value which is smaller than the normally accepted ~210 Mev. During the investigation of Ilford G-5 plates exposed to cosmic rays at 2867 m elevation, a special case was revealed which aroused serious considerations of the fact that a "light" θ^0 particle with mass of nearly $600m_e$ really exists. A method of θ^0-decay statistical analysis which should clarify the general characteristics of the abnormal decay (if such really exists) is discussed. (R.V.J.)

7924
ANGULAR CORRELATIONS IN ASSOCIATED PRODUCTION. W. D. Walker and W. D. Shephard (Univ. of Wisconsin, Madison). Phys. Rev. 101, 1810-15(1956) Mar. 15.

Five examples of associated production have been found in π^--p collisions at 1.0 Bev. Three cases of $\Lambda^0 + \theta^0$, one case of $\Sigma^0 + \theta^0$, and one case of $\Sigma^- + K^+$ have been found. From these cases a cross section of about 1 mb is deduced. The center-of-mass angular distribution of the hyperons is com-

pared with that found by W. B. Fowler et al. at 1.4 Bev. The hyperons show a strong correlation between their decay planes and their planes of production as has been found previously by Fowler et al. The θ^0 do not show this tendency. The possibilities of observational bias are considered. One explanation of these phenomena is that the orbital angular momentum vector and spin vector of the hyperon are either parallel or antiparallel. From these and other considerations it seems likely that the spin of the hyperons Σ and Λ^0 is $^3/_2$ or $^5/_2$ or possibly as high as $^7/_2$ and the spin of the θ^0 is probably 0 but could be 1. (auth)

7925
POSSIBLE METHOD OF MEASURING MAGNETIC MOMENTS OF V PARTICLES. M. Goldhaber (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 101, 1828(1956) Mar. 15.

It is suggested that it might be possible to determine the sign and magnitude of the magnetic moment of Λ^0 by studying the effect of a magnetic field on the distribution of decay planes. (B.J.H.)

7926
FURTHER EVIDENCE ON THE NATURE OF THE NEUTRAL PARTICLES IN THE DECAY SCHEME OF $K_{\mu 3}$. T. F. Hoang, M. F. Kaplon, and G. Yekutieli (Univ. of Rochester, N. Y.). Phys. Rev. 101, 1834-5(1956) Mar. 15.

The analysis of a new case of $K_{\mu 3}$ decay is reported, and the neutral particle, X_0, in the decay is shown to be massless. (B.J.H.)

7927
THE POSSIBILITY OF THE FORMATION OF Λ^0-PARTICLES BY PROTONS WITH ENERGIES UP TO 700 MEV. M. P. Balandin, B. D. Balashov, V. A. Zhukov, B. M. Pontecorvo, and G. I. Selivanov (Inst. for Nuclear Problems, U.S.S.R.). Soviet Phys. JETP 2, 98-105(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 265-73(1955) Sept. (In Russian)

An attempt was made to observe the formation of Λ^0 particles in collisions of 670-Mev protons with carbon nuclei. In principle, the experiment allowed the detection of Λ^0 particles with the decay scheme $\Lambda^0 \rightarrow n + \pi^0$. Gamma-rays for the decay of π^0-mesons were detected by means of a telescope of scintillation and Cerenkov counters. It was found that the cross section for the creation of Λ^0 particles has a value of $\sigma_{\Lambda_0} \lesssim 10^{-31}$ cm^2/nucleon. Conclusions are drawn on the mechanism of creation of Λ particles. (auth)

Refer also to abstracts 7798 and 8030.

METEOROLOGY

7928 NP-6017(p.45-70)
National Academy of Sciences.
REPORT OF THE COMMITTEE ON METEOROLOGICAL ASPECTS OF THE EFFECTS OF ATOMIC RADIATION. p.45-70 of THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: SUMMARY REPORTS. 1956. 26p.

Radioactive contamination of the atmosphere from non-military sources is considered. Both large-scale contamination on a global or hemispheric basis and local or regional contamination in the area of processing plants are considered. The contributions of Kr^{85} and I^{131} to atmospheric contamination are discussed. It is concluded that the solution to the radioactive air pollution problem lies in the prevention of the escape of pollutants to the atmosphere. Radioactivity in the atmosphere due to cosmic ray interactions in the stratosphere, radioactive rock and soil on the earth outer crust, nuclear weapons tests, and artificially introduced radioactive tracers is discussed. It is pointed out that no statistically significant changes in the weather during the first ten years of the atomic age have been found. (C.H.)

MOLECULAR PROPERTIES

7929
CROSS-SECTIONS OF MOLECULES FOR IONIZATION BY ELECTRONS. J. W. Otvos and D. P. Stevenson (Shell Development Co., Emeryville, Calif.). J. Am. Chem. Soc. 78, 546-51(1956) Feb. 5.

It is shown that for a wide variety of substances including hydrocarbons and their substitution derivatives, the total relative ionization cross-sections as measured in ion gages or mass spectrometers (low pressures and low energy electrons), or by total ion production in gases (at or near atmospheric pressure) by C^{14} or $Sr^{90}-Y^{90}$ β-particles, are a constitutive molecular property. It is further shown that, particularly for ionization by single electron impact and to a lesser degree for total ion production by β-particles, the atomic ionization cross-sections of the elements are given by the sum of the valence electrons weighted by the mean square radii of those electrons as calculated for hydrogen-like wave functions for the electrons. A table of calculated atomic ionization cross-sections is given for elements with $1 \leq Z \leq 56$, and $Z = 80$, 81 and 82. The utility of the rules for ionization cross-sections in various analytical applications is described and illustrated. (auth)

7930
ON THE METHOD OF ATOMS IN MOLECULES. II. AN INTRA-ATOMIC CORRELATION CORRECTION. A. C. Hurley (Univ. of Cambridge, England). Proc. Phys. Soc. (London) A69, 49-56(1956) Jan. 1.

The method of atoms in molecules is modified in such a way as to overcome difficulties encountered in previous calculations. The modified theory is applied to two calculations on the ground state of the hydrogen molecule. The more accurate of the two modified calculations lead to an energy curve accurate to within 0.05 electron volt in the range 1 to 4 atomic units of the nuclear separation. (auth)

NEUTRONS

7931 ANL-5567
Argonne National Lab., Lemont, Ill.
NEUTRON SCATTERING ANGULAR DISTRIBUTION. A. Langsdorf, Jr., R. O. Lane, and J. E. Monahan. June 1956. 163p. Contract W-31-109-eng-38. $0.75(OTS).

The results of a survey of the angular distribution of neutrons scattered from 36 elements, two compounds, and one alloy are reported. (F.S.)

7932 ORNL-2098
Oak Ridge National Lab., Tenn.
NEUTRON SLOWING DOWN BY HYDROGEN IN THE CONSISTENT P_1 APPROXIMATION. Albert Simon. July 19, 1956. 29p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Some analytical solutions for the flux, slowing down density, and age are derived in the consistent P_1 approximation to the Boltzmann equation. One solution is for pure, non-absorbing H with a 1/v scattering cross section. The other is for all cross sections constant with the heavy elements assumed to have infinite mass. These results are compared with the corresponding predictions of the Selengut-Goertzel theory, and a tentative explanation of the gross behavior is advanced. (auth)

7933 TOI-55-25
Technical Operations, Inc., Arlington, Mass.
PENETRATION OF NEUTRONS IN AIR. Samuel S.

Holland, Jr. and Paul I. Richards. Sept. 1955. 118p. Contract AF29(601)-178. (AFSWC-TR-55-27).

Neutron flux calculations were made as a function of distance from an isotropic monoenergetic source in an infinite homogeneous volume of air at S.T.P. Eight neutron energies in the range 0.025 ev to 14 Mev were considered. The method of moments was employed and is discussed. Results are tabulated. (D.E.B.)

7934 UCRL-3414

California. Univ., Berkeley. Radiation Lab.
A SUSPENDABLE PULSED NEUTRON SOURCE.
Lawrence Ruby. May 14, 1956. 15p. Contract W-7405-eng-48. $0.20(OTS).

A laboratory pulsed neutron source has been constructed which may be suspended above or below floor level. The accelerator system consists principally of an ion source of the cold-cathode Phillips Ion Gauge type, extractor and focus electrodes, and an air-cooled target electrode. A cascade rectifier power supply allows the target voltage to be varied up to 100 kv. During the pulse the ion source is capable of delivering 4 ma of current, of which half is monatomic. The arc is pulsed for 200 μsec at a repetition rate of 60 cps. The integrated yield produced on the target exceeds 6×10^5 neutrons per sec for the d-d reaction and 6×10^7 neutrons per sec for the d-t reaction. The pulsed neutron generator is characterized by the absence of critical adjustments in any of the parameters governing its operation. (auth)

7935

PERTURBATION OF NEUTRON DENSITIES BY FOILS.
M. A. Vigón and L. Díez. Anales real soc. españ. fis. y quim. (Madrid), Ser. A 52A, 5-10(1956) Jan.-Feb. (In Spanish)

The introduction of neutron absorbers in diffuse media, produces local disturbances of neutron density. The disturbance depends especially on the nature and size of the absorber. Approximate equations which relate the disturbance and the distance to the absorber in the case of thin disks have been found. Experimental tests were carried out in two special cases. In both cases, the experimental results are in agreement with the calculated values from these equations. (auth)

7936

ANGULAR DISTRIBUTION OF THE D + D NEUTRONS.
Paul R. Chagnon and George E. Owen (Johns Hopkins Univ., Phys. Rev. 101, 1798-1803(1956) Mar. 15.

The angular distributions of the neutrons produced in the $D(d,n)He^3$ reaction have been investigated experimentally in the deuteron energy range of 0.25 to 0.825 Mev. A two-crystal neutron spectrometer providing discrimination against gamma radiation was used as the detector. It is noted that the experimental data can be fitted by the deuteron stripping theory. (auth)

NUCLEAR PHYSICS

7937 NP-5913

Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas.
THE PHOTONUCLEAR EFFECT AND THE COMPLEX POTENTIAL-WELL NUCLEAR MODEL. Notas de Física, Vol. II, No. 2. J. P. Davidson. Jan. 30, 1955. 6p.

Three forms of the imaginary part of the square well potential are used as parameters in giant photon resonance calculations. Calculated and experimental values are compared. (D.E.B.)

7938 NP-5914

California. Univ., Berkeley.
NUCLEON ENERGY LEVELS IN A DIFFUSE POTENTIAL. Technical Report No. 4. A. A. Ross, Hans Mark, and R. D. Lawson. [1955]. 25p. Contract DA-04-200-ord-171.

The level sequence and shell structure for the bound single particle states of nucleons moving in the spherically symmetric potential $V(r) = -V_0/1+\exp\alpha(r-a)$ has been examined. For protons, a Coulomb potential was added corresponding to a uniform charge distribution out to the "nuclear radius", a, and the potential depth was increased to give sufficient binding energy for the last proton level in the nucleus under consideration. For $\alpha = 1.45 \times 10^{+13}$ cm^{-1} (implying a surface layer of approximately 3×10^{-13} cm, which is constant for all A), a spin orbit coupling 39.5 times the Thomas term and $a = 1.3A^{1/3} \times 10^{-13}$ cm, good shell structure is obtained for both neutrons and protons. The level sequences obtained are in close agreement with experiment except in the region of strong distortion from sphericity. For $V_0 = 42.8$ Mev the neutron binding energies are in reasonable agreement with experiment. With these parameters the 3s and 4s giant resonances in the low energy neutron scattering cross section occur at A = 56 and 166, respectively. The neutron and proton distributions in 79 Au^{197} are examined. With the values of α, r_0 and λ given above, the thickness of the surface layer on the proton distribution is 1.92×10^{-13} cm and the radius is 6.77×10^{-13} cm. (auth)

7939 NP-5923

Pittsburgh. Univ. Sarah Mellon Scaife Radiation Lab.
EXPERIMENTS ON THE ANGULAR CORRELATION BETWEEN ANNIHILATION QUANTA AT SMALL ANGLES. I. NARROW COMPONENTS IN CONDENSED MATERIALS. Final Report [for] December 1, 1954 through November 30, 1955 [on] RESEARCH AND DEVELOPMENT ON STUDY OF POSITRONIUM AND MAGNETIC MOMENT OF THE ELECTRON. Lorne A. Page and Milton Heinberg. 56p. Project Nos. 599-01-004 and TB2-0001(531). Contract DA 36-061-ORD-396.

Measurements on the angular correlation of two-photon annihilation of positrons within 10 milliradians of 180° show that amorphous materials, known or expected to have a long-lived component, have a more pointed distribution than crystalline materials, as though a narrow component were present. The former group includes fused quartz, teflon, polystyrene, polyethylene, paraffin, lucite, and glass; the latter, crystalline quartz, aluminum, magnesium, copper, graphite, and sulfur crystals. Cane sugar, either as "crystals" or as a plastic material, is empirically classified with the narrow-component group. Magnetic experiments up to 16.3 kilogauss cause a transfer of 3 to 4% of the annihilation events into the narrow component from the rest of the events, when the narrow component already exists in the material in agreement with the assumption that a triplet state of a positron-electron system is being quenched. Experiments under way are designed to estimate the positron-electron overlap by measurement of the field dependence of this effect. A preliminary experiment on possible diffusion of annihilation centers is described. (auth)

7940 NP-5925

California. Univ., Berkeley.
RELATIVISTIC EFFECTS IN NUCLEAR FORCES (thesis). Technical Report No. 5. Hans-Peter Duerr. [1956]. 41p. Contract DA-04-200-ord-171.

An attempt is made to reformulate in a relativistically invariant way a phenomenological theory proposed by Johnson and Teller. Such a generalized theory reproduces the earlier results, i.e., saturation of nuclear binding and approximately correct neutron to proton ratios. It also avoids the collapse of the nucleus occurring in the non-relativistic theory for high kinetic energies. The theory

predicts as a secondary result an extremely strong spin-orbit coupling which is of the order of magnitude of the phenomenological coupling introduced in the shell model. Furthermore, the theory predicts a strong attraction between nucleons and anti-nucleons. This could lead to an S bound state as the ground state of the nucleon–anti-nucleon system having the properties of a pseudo-scalar meson. The strong attraction between anti-nucleons and nuclear matter also suggests a high value for the collision cross section of anti-protons with nuclei, an effect which has recently been observed. (auth)

7941

NUCLEAR REACTIONS OF INTERMEDIATE ENERGY HEAVY PARTICLES. D. C. Peaslee (Purdue Univ., Lafayette, Ind.) Ann. Rev. Nuclear Sci. 5, 99-144(1955).

Discussions of the eigenstate decomposition, statistical and optical models, and cross-section determination in nuclear reactions (incident particle energy–0 to 65 Mev) are presented. 130 references. (C.W.H.)

7942

NUCLEAR EVAPORATION AND TEMPERATURE, PRELIMINARY RESULTS OF THE STUDY OF THE SPECTRUM OF THE PHOTOPROTONS FROM THE REACTION Cu(γ,p)Ni, WITH THE HELP OF A SPECTRUM OF MONOCHROMATIC RAYS. Raymond Chastel. Compt. rend. 242, 1440-3(1956) Mar. 12. (In French)

The energy distribution of the photoprotons produced by a spectrum comprising two monochromatic rays of 14.8 and 17.6 Mev on Cu has allowed a measurement of the nuclear temperature. The value obtained for a 10-Mev excitation energy of the residual nucleus is about 1.0 ± 0.1 Mev. For the γ energies used, the direct photonuclear effect does not seem to be very important. (tr-auth)

7943

SOLUTION OF THREE-NUCLEON MOTION PROBLEM IN THE LIMITING CASE OF SHORT RANGE FORCES. G. V. Skornyakov and K. A. Ter-Martirosyan (Leningrad Physico-Technical Inst.). Doklady Akad. Nauk S.S.S.R. 106, 425-8 (1956) Jan. 21. (In Russian)

The three-nucleon problem permits similar disintegrations in series by degrees r_0, where $r_0/\lambda\!\!\!^{-} < 1$ and $\alpha r_0 < 1$, where $\lambda\!\!\!^{-} = \hbar/\sqrt{ME}$, and E is the energy of the system. This disintegration may be used in the investigation of neutron scattering by small-energy deuterons (up to 10 to 15 Mev) and for projecting the wave functions of nuclei H^3 and He^3. (R.V.J.)

7944

INDICATIONS FOR A STRONG INFLUENCE OF THE NUCLEAR SIZE ON MAGNETIC DIPOLE CONVERSION COEFFICIENTS. A. H. Wapstra and G. J. Nijgh (Instituut voor Kernphysisch Onderzoek, Amsterdam, Netherlands). Nuclear Phys. 1, No. 4, 245-58(1956).

An analysis of the conversion coefficients of the 279-kev transition in Tl^{203} indicates that the theoretical conversion coefficients as computed by Rose et al. disagree with the experimental data. In this case as well as in those of other transitions in heavy nuclei a better agreement is obtained if the theoretical K and L_I shell conversion coefficients for M1 transitions are lowered by about 40%. Probably this is due to the fact that the finite size of the nucleus was not taken into account in the theoretical calculations. The data about L_{II} conversion are controversial. (auth)

7945

COLLECTIVE MOTIONS OF A SHELL STRUCTURE. J. M. Araújo (Univ. of Manchester, England). Nuclear Phys. 1, No. 4, 259-77(1956).

Collective motions in atomic nuclei are studied using a generalised independent particle model (time dependent well potential). After calculating nucleon wave functions in a time dependent infinitely deep well, the expectation values of the energy and angular momentum are evaluated. These are shown to be formally identical with the liquid drop quantities. By imposing on the expectation value of the energy the condition of time independence, an eigenfrequency equation is obtained. The calculated frequencies and static deformabilities show considerable fluctuations. Some experimental evidence for these fluctuations is discussed. (auth)

7946

CURVATURE CORRECTION TO THE SAGITTA DISTRIBUTION OF IONIZATION TRACKS. H. Wergeland and H. Överaas (Norges Tekniske Högskole, Trondheim). Nuclear Phys. 1, No. 4, 304-7(1956).

Sagitta measurements are used in obtaining the mean square deflection per unit length of particle track in multiple scattering studies through the application of Scott's formula. A refinement of this formula was attempted in an effort to explain discrepancies in experimental and theoretical multiple scattering values. Formula analysis indicates the error introduced by small-angle approximation is too small to explain the observed discrepancies. (D.E.B.)

7947

NUCLEON-CORE POLARIZATION IN THE CALCULATION OF THE STRENGTH FUNCTION. Erich Vogt (Palmer Physical Lab., Princeton, N. J.). Phys. Rev. 101, 1792-8 (1956) Mar. 15.

The model of Lane, Thomas, and Wigner, for the excited states of nuclei, is generalized by the introduction of a variable amount of nucleon-core polarization into the states of the independent-particle model. The mixing of each of the polarized states, by configuration interaction, into a small neighborhood near the initial energy of the state forms the basis of our model. The energy moments of the strength function are calculated. The second moment of the strength function, which may be roughly equal to the square of the full width at half-maximum of the strength function, is calculated approximately using a two-body Yukawa potential without exchange. By the choice of a suitable amount of core polarization the large value obtained by Lane, Thomas, and Wigner for the second moment $[(22\text{Mev})^2]$ is reduced by a factor of 23 to the reasonably small value of $(4.8\ \text{Mev})^2$. (auth)

7948

POSSIBLE ORIGIN OF 1·S FORCES IN NUCLEI. David H. Frisch (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 101, 1833-4(1956) Mar. 15.

The 1·s interaction between a nucleon's spin and orbital motion in a nucleus is estimated from the average interaction of the whole nucleon with all the other mesons only. (B.J.H.)

7949

THE POLARIZATION OF γ-RADIATION FROM THE REACTIONS $^{27}Al(p,\gamma)^{28}Si$, $^{26}Mg(p,\gamma)^{27}Al$, $^{23}Na(p,\gamma)^{24}Mg$. I. S. Huges and D. Sinclair (Univ. of Glasgow, Scotland). Proc. Phys. Soc. (London) A69, 125-34(1956) Feb. 1.

Measurements of the polarization of some of the high energy γ-rays from the reactions $Al^{27}(p,\gamma)Si^{28}$, $Mg^{26}(p,\gamma)Al^{27}$ and $Na^{23}(p,\gamma)Mg^{24}$ have been made using nuclear emulsions impregnated with D_2O. The results obtained enable assignments of even parity to be made to the ground and first excited states of Al^{27} and to the ground state of Na^{23}. A range-energy relation for protons up to 5 Mev in wet emulsions is given in an appendix. (auth)

7950

THE EFFECT OF FINITE NUCLEAR SIZE ON ELECTRON PAIR PRODUCTION. E. H. S. Burhop (Univ. Coll., London). Proc. Phys. Soc. (London) A69, 135-40(1956) Feb. 1.

Calculations have been carried out of the energy and

angular distribution of the electrons produced in the process of pair production by incident quanta using Born's approximation and assuming different forms for the distribution of electric charge on the nucleus. The effect of the finite charge distribution is large for large angle pairs produced by quanta of energy above 20 Mev, but there are only small differences between the effects to be expected for different distributions. (auth)

7951

THE DISCOVERY OF ANTIPROTONS. G. Luders. Naturwissenschaften 43, 121-3(1956) Mar. (In German)

NUCLEAR PROPERTIES

7952 AERE-NP/R-1894

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THERMAL NEUTRON ACTIVATION CROSS-SECTION OF SODIUM. S. J. Cocking and J. F. Raffle. Mar. 28, 1956. 10p.

The thermal neutron activation cross section of sodium has been measured relative to that of Au comparing the induced activities in Na_2Cl_2 samples irradiated in the thermal column of BEPO with Au foil samples irradiated simultaneously. The induced activity was measured absolutely by β–γ coincidence counting. By taking a value of 98.5 barns for the absorption cross section of Au for 2200 m/sec neutrons σ_{Na} (absorption) = 0.536 ± 0.006 barns. (auth)

7953

ELECTROMAGNETIC TRANSITIONS IN NUCLEI. M. Goldhaber and J. Weneser (Brookhaven National Lab., Upton, N. Y.) Ann. Rev. Nuclear Sci. 5, 1-24(1955).

Transition probabilities for electric and magnetic L-multipoles are evaluated for one-particle shell, many-particle shell, and collective models. The evidence on the modifications and magnitude of exchange currents is discussed. 57 references. (C.W.H.)

7954

DETERMINATION OF γ TRANSITIONS IN THE REACTION $Ne^2(d,p)Ne^{21*} \rightarrow (\gamma)Ne^{21}$. Serge Gorodetzky, Theo Muller, and Marcel Port. Compt. rend. 242, 1281-4(1956) Mar. 5. (In French)

A coincidence technique was used to study the γ rays accompanying the protons in the reaction $Ne^{20}(d,p)Ne^{21}$. Gamma rays of 0.35, 1.05, 1.42, and 2.78 Mev were found, and the γ cascade scheme of this reaction is shown. (B.J.H.)

7955

COULOMB EXCITATION OF MERCURY ISOTOPES. Roland Barloutaud, Tovy Grjebine, and Michel Riou. Compt. rend. 242, 1284-7(1956) Mar. 5. (In French)

The Coulomb excitation of Hg isotopes by protons allows the determination of the reduced excitation probabilities of the first levels of Hg^{198}, Hg^{200}, and Hg^{202} and of the first two of Hg^{199}. (tr-auth)

7956

L FLUORESCENCE SPECTRUM OF PLUTONIUM. Yvette Cauchois and Ioana Manescu. Compt. rend. 242, 1433-6 (1956) Mar. 12. (In French)

Previous observations on the absorption spectrum and 4 emission lines of Pu, using about 10 mg of PuO_2, were extended to some twenty new emissions. (tr-auth)

7957

ON THE EXCITED LEVELS OF Eu^{153}. Nadine Marty and Michel Vergnes. Compt. rend. 242, 1438-40(1956) Mar. 12. (In French)

In addition to the 103- and 69-kev photons emitted in the disintegration of Sm^{153}, evidence is shown, in the disintegration of Gd^{153}, for a 98 ± 0.5-kev electric dipole photon not in coincidence with the 103-kev γ and of intensity close to that of the 103-kev γ. The L/K capture ratio for the set of disintegrations is greater than 1. (tr-auth)

7958

THE REACTION $O^{18}(p,n)F^{18}$ AND THE LEVELS OF F^{18} Victor Naggiar, Monique Roclawski-Conjeaud, Dolly Szteinsznaider, and Jacques Thirion. Compt. rend. 242, 1443-6(1956) Mar. 12. (In French)

The levels of F^{18} are studied by an examination of the slow neutron thresholds in the reaction $O^{18}(p,n)F^{18}$. Two excited levels of 960 ± 10 and 1065 ± 15 kev are observed and a third at 1245 ± 10 kev is probable. (tr-auth)

7959

ISOMERIC STATE OF SHORT HALF LIFE IN $UX_2(Pa^{234})$. Hamlet Vartapetian and Louis Dick. Compt. rend. 242, 1602-4(1956) Mar. 19. (In French)

By the method of delayed coincidences using NaI(Tl) scintillators, it is shown that the 93-kev level has a half life of $T_{1/2} = (1.8 \pm 0.3) \times 10^{-9}$ sec. The nature of the γ transitions in UX_2 are also specified. (tr-auth)

7960

EFFECTIVE CROSS SECTION OF URANIUM AND THORIUM NUCLEAR PHOTOFISSION. V. A. Korotkova, P. A. Cherenkov, and I. V. Chuvilo (Lebedev Inst. of Physics). Doklady Akad. Nauk S.S.S.R. 106, 633-6(1956) Feb. 1. (In Russian)

Investigations were made of the relation of uranium and thorium effective cross sections to the energy of γ radiation. The experiments with γ bremsstrahlung were made with the Lebedev Inst. of Physics synchrotron in the maximum energy interval of the bremsstrahlung spectra of 8 to 24 Mev. Photofission emissions were measured on samples of uranium of 1.76 mg/cm^2 thickness and thorium of 0.8 mg/cm^2. Maximum values for the effective cross section of uranium is 8.7×10^{-26} and for thorium 2.6×10^{-26} The error of these values reaches 30% because of the inaccuracy during the smoothing of the photofission emission curves. (R.V.J.)

7961

CRITICAL IONIZATION POTENTIALS USING A PARALLEL-PLATE ENERGY SELECTOR. Dwight A. Hutchison (Argonne National Lab., Lemont, Ill.). J. Chem. Phys. 24, 628-9(1956) Mar.

The critical ionization potentials of argon were determined using a parallel-plate energy selector for the electron beam. Close agreement was obtained with optical values. (C.W.H.)

7962

ORBITAL MOMENTUM FORBIDDEN MAGNETIC DIPOLE TRANSITIONS IN SOME ODD PROTON NUCLEI. H. De Waard and T. R. Gerholm (Univ. of Uppsala). Nuclear Phys. 1, No. 4, 281-301(1956).

The half lives of the following excited nuclear states have been measured with delayed coincidence techniques:

145 keV level in Pr^{141}:	$T_{1/2} = (19 \pm 2) \times 10^{-10}$ sec
163 keV level in La^{139}:	$T_{1/2} = (15 \pm 1) \times 10^{-10}$ sec
160 keV level in I^{131}:	$T_{1/2} = (9 \pm 1) \times 10^{-10}$ sec
279 keV level in Tl^{203}:	$T_{1/2} = (1.2 \pm 0.3) \times 10^{-10}$ sec

Theoretical points of view about these 1-forbidden ($\Delta l = 2$, $\Delta j = 1$) M1 transitions are briefly reviewed and it is shown that the matrix elements derived from the experimental half lives are in reasonable agreement with expectations based on the spin-orbit coupling encountered in the shell model. (auth)

7963

HYPERFINE STRUCTURE AND NUCLEAR MOMENTS OF GADOLINIUM. David Ralph Speck (Univ. of California,

Berkeley). Phys. Rev. 101, 1725-9(1956) Mar. 15.

Study of the optical hyperfine structure of several Gd I lines using enriched isotopes shows that the spins of the odd isotopes Gd^{155} and Gd^{157} each are $\frac{3}{2}$. The ratio of the magnetic moments is $\mu_I(Gd^{155})/\mu_I(Gd^{157}) = 0.80 \pm 0.02$. The magnetic moment for Gd^{157} obtained from two lines is -0.37 ± 0.04 nm. Deviations from the interval rule in these two lines can be accounted for with a quadrupole moment of approximately 1.0×10^{-24} cm^2 for Gd^{157} and 1.1×10^{-24} cm^2 for Gd^{155} The known anomolous isotope shift between neutron numbers 88 and 90 (Gd^{152} and Gd^{154}) is accurately measured for several lines. (auth)

7964

INELASTIC SCATTERING OF PROTONS BY Ca^{40}. C. M. Braams (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 101, 1764-7(1956) Mar. 15.

The inelastic scattering of protons by Ca^{40} was investigated with the MIT-ONR electrostatic generator and a 180-degree magnetic spectrograph. Bombarding energies from 6.54 to 8.15 Mev were used, targets were made of calcium, and the reaction angle was 90 degrees. Excited states of Ca^{40} were found at 3.348 ± 0.004, 3.730 ± 0.004, 3.900 ± 0.004, 4.483 ± 0.005, 5.202 ± 0.008, 5.241 ± 0.006, 5.272 ± 0.006, 5.606 ± 0.009, 5.621 ± 0.008, 5.901 ± 0.008, and 6.029 ± 0.008 Mev. (auth)

7965

GAMMA RAYS FROM EXCITED LEVELS IN Al^{25}. H. Ager-Hanssen, O. M. Lönsjö, and R. Nordhagen (Univ. of Oslo, Blindern, Norway). Phys. Rev. 101, 1779-83(1956) Mar. 15.

To measure the energy of γ rays following resonances in the $Mg^{24}(p,\gamma)Al^{25}$ reaction, thin targets of natural magnesium have been bombarded with protons. The radiation of the resonances at 222, 418, and 825 kev proton energy have been investigated, and the γ-ray spectra have been observed with a single NaI(Tl) crystal scintillation counter and a Hutchinson and Scarrott pulse height analyzer. Several γ rays are identified in the spectra, corresponding to transitions from excited levels in Al^{25} at 3.08 ± 0.03, 2.69 ± 0.02, 2.50 ± 0.06, 1.80 ± 0.02, 0.95 ± 0.08, and 0.45 ± 0.06 Mev energy. From estimates of the γ-ray intensities the following spin assignments are given: For the 2.69-Mev level in Al^{25}, $\frac{1}{2}+$; for the 2.50-Mev level, $\frac{1}{2}\pm$; for the 1.80-Mev level, $\frac{3}{2}-$; and for the 0.95-Mev level, $\frac{3}{2}+$. No γ rays were found to accompany the 7-second positron activity from Al^{25}. A measurement of the radiation from the annihilation of the positrons is included. (auth)

7966

AVERAGE NUMBER OF NEUTRONS PER FISSION FOR SEVERAL HEAVY-ELEMENT NUCLIDES. W. W. T. Crane, G. H. Higgins, and H. R. Bowman (Univ. of California, Livermore). Phys. Rev. 101, 1804-5(1956) Mar. 15.

The relative average number of neutrons per fission, $\bar{\nu}$, of several spontaneous fissioning nuclides has been measured by making use of the coincidence between fission events and neutrons detected in a LiI(Eu) crystal. (auth)

7967

NEUTRON AND PROTON DENSITIES IN NUCLEI. Lawrence Wilets (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 101, 1805-9(1956) Mar. 15.

A semiempirical investigation of neutron and proton densities in nuclei is made. Experimental values are assumed for the nuclear radius, binding energy, surface energy, surface thickness, and symmetry energy. It is found that the neutron and proton densities extend to approximately the same radius; these results do not depend sensitively on the input data. The nuclear potential extends $\sim 0.7 \times 10^{-13}$ cm further than the material radius. An estimate of $\lesssim$100A Mev is given for nuclear compressibility. (auth)

7968

hfs SEPARATIONS AND hfs ANOMALY IN THE $6^2P_{\frac{3}{2}}$ METASTABLE LEVEL OF Tl^{203} AND Tl^{205}. Gordon Gould (Columbia Univ., New York). Phys. Rev. 101, 1828-9(1956) Mar. 15.

The isotopic hyperfine structure anomaly in the $6^2P_{\frac{3}{2}}$ level was found to be $A_{\frac{3}{2}} = -0.001626 \pm 0.000002$. This result is briefly discussed. (B.J.H.)

7969

NUCLEAR MOMENTS OF Hf^{177} AND Hf^{179}. D. R. Speck and F. A. Jenkins (Univ. of California, Berkeley). Phys. Rev. 101, 1831-3(1956) Mar. 15.

Multilayer coated Fabry-Perot etalons were used to study the hyperfine structure of Hf^{177} and Hf^{179}. The observed structures can only be interpreted by assigning $I = \frac{7}{2}$ to Hf^{177} and $I = \frac{9}{2}$ to Hf^{179}. The ratio of the magnetic moments was calculated to be $\mu(177)/\mu(179) = -1.276 \pm 0.008$. (B.J.H.)

7970

OPTICAL MODEL OF NUCLEUS WITH ABSORBING SURFACE. F. E. Bjorklund, S. Fernbach, and N. Sherman (Univ. of California Radiation Lab., Livermore). Phys. Rev. 101, 1832-3(1956) Mar. 15.

A Gaussian-type well was chosen for the imaginary part of the nuclear potential, and the usual tailed well was chosen for the real part. An exact phase-shift analysis using these wells was carried out for 14.6-Mev neutrons incident on Mg, Ca, Cd and Bi. Resultant angular distributions are compared with experimental values. (B.J.H.)

7971

BOLOMETER DETECTION OF NUCLEAR QUADRUPOLE RESONANCE. Hugh G. Robinson (Duke Univ., Durham, N. C.). Rev. Sci. Instr. 27, 163-4(1956) Mar.

The possibility of using bolometer detection for quadrupole resonance is investigated. Preliminary results in the 30 Mc region indicate that such a detection method can be made to operate easily and at a sensitivity comparable to conventional regenerative detectors. Scaling to other frequencies should be possible without the difficulties encountered in regenerative and super-regenerative detectors. (auth)

7972

THE CONNECTION BETWEEN THE VIBRATIONS OF THE SURFACE OF A NUCLEUS AND SINGLE NUCLEON EXCITATION. A. S. Davidov (Moscow State Univ.). Soviet Phys. JETP 2, 62-8(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 75-85(1955) July. (In Russian)

The conditions of validity of a model of single nucleon excitations in a nucleus are investigated by the method of adiabatic approximation. The effect of the relation between single nucleon excitations and the vibrations of the surface of a nucleus on the excited states of the whole nucleus are established. (auth)

7973

THE CHARACTERISTICS OF "SPECIFIC" ZONES. M. A. Levitskaia (Voronezh State Univ., U.S.S.R.). Soviet Phys. JETP 2, 119-25(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 158-65(1955) Aug. (In Russian)

Twenty characteristics distinguishing the "specific" zones from the rest of the nuclide system are listed. Almost all characteristics are substantially different for odd and even Z. The author's opinion is that the specific zones cannot be considered as regions influenced by the "magic" numbers; on the contrary, the "magic" numbers are considered a consequence of the specific zones. (auth)

7974

DETERMINATION OF TRANSVERSE RELAXATION TIMES IN THE MAGNETIC RESONANCE OF ATOMIC NUCLEI IN WEAK HIGH FREQUENCY MAGNETIC FIELDS. S. D.

Gvozdover and N. M. Ievskaia (Moscow State Univ.). Soviet Phys. JETP 2, 90-7(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 227-36(1955) Aug. (In Russian)

A method of measurement of the transverse relaxation times is developed, based on the determination of the interval of time between the extrema of the dispersion signal in a weak high-frequency magnetic field in the case of a non-adiabatic transition through resonance. Relations are obtained (and plotted graphically) which allow the determination of the time of transverse relaxation. As an experimental verification of the method, the dependence of the transverse relaxation time on the concentration of paramagnetic ions was measured in aqueous solutions of copper sulfate and ferric nitrate. (auth)

7975

THE AVERAGE NUMBER OF NEUTRONS PER FISSION EVENT IN THE PHOTODISINTEGRATION OF URANIUM AND THORIUM. B. N. Baluev, B. I. Gavrilov, G. N. Zatsepina, and L. E. Lazareva (P. N. Lebedev Inst. of Physics, U.S.S.R.). Soviet Phys. JETP 2, 106-10(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 280-5(1955) Sept. (In Russian)

The average number of neutrons ν from a single fission event has been measured in the photodisintegration of uranium and thorium with a mean nuclear excitation energy of 12 Mev. For uranium, the value of ν is 6.2 ± 0.5, for thorium 14.2 ± 1.2. The measured quantities allowed evaluation of the relative fission probability in photodisintegration of uranium and thorium nuclei. (auth)

7976

ASYMMETRY OF FRAGMENT RANGES IN THE FISSION OF HEAVY NUCLEI BY ULTRAFAST PARTICLES. V. P. Shamov and O. V. Lozhkin (Radium Inst., U.S.S.R.). Soviet Phys. JETP 2, 111-15(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 286-91(1955) Sept. (In Russian)

From the data of a study of fission of U, Bi and W by 660-Mev protons, carried out in fine-grained nuclear P-9 emulsions, the distribution of the ratio of fragment ranges for various excitation energies of the fissioning nucleus was constructed. With increasing excitation energy, the fraction of strongly asymmetric fissions increases; this increase is significantly greater for Bi than for U. For excitation energies $\gtrsim 400$ Mev, the character of fission is the same for U, Bi and W. The region of excitation energy in which fission is most symmetric is estimated to be 60 to 100 Mev for uranium, and ~100 Mev for Bi. (auth)

Refer also to abstract 8076.

NUCLEAR REACTORS

7977 AERE-R/M-18

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE BUILD-UP OF POISONS OF SHUT-DOWN OF A REACTOR. J. F. Hill. Dec. 19, 1952. Decl. Jan. 22, 1956. 5p.

It is well known that the amount of Xe^{135} poison in a high flux reactor increases in magnitude when the reactor is shutdown. The buildup of other fission product poisons is considered here and shown to be only of secondary importance in a thermal reactor operating at a thermal neutron flux as high as 10^{14} neutrons/cm^2/sec. (auth)

7978 AERE-R/R-1980

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

AN ANALYSIS OF POWER, TEMPERATURE AND REACTIVITY TRANSIENTS IN B.E.P.O. D. V. Wordsworth. Sept. 1953. Decl. with Amendments Feb. 2, 1956. 20p.

Revised version of AERE-E/R-1245.

A method has been found which enables power-temperature transients to be calculated with fair accuracy for a BEPO-type pile. Maximum power and minimum temperature estimates are satisfactory. (F.S.)

7979 APEX-233

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

SUMMARY OF THE GE-ANP REACTOR MACHINE COMPUTATION PROGRAM. D. S. Selengut. Apr. 6, 1955. Decl. Dec. 13, 1955. 18p. (XDC-55-4-44).

This report meets Milestone VB of Task 7205.

The machine codes for reactor computations which have been set up on the IBM 701 digital computer at the Aircraft Gas Turbine plant in Evendale are described. Sufficient information on input and output is given to allow the use of presently available codes. Some discussion of future work is included. (auth)

7980 CF-54-7-88(Pt. II)

Oak Ridge National Lab., Tenn.

NOTES ON REACTOR ANALYSIS. PART II. THEORY. D. K. Holmes and R. V. Meghreblian. Aug. 1955. 438p. Contract [W-7405-eng-26]. $0.50(OTS).

In this volume on reactor analysis, heterogeneous and reflected reactors are surveyed. The theory of cross sections, neutron flux, diffusion and slowing down of neutrons, the transport theory and the diffusion approximation and reactor kinetics is analyzed. (F.S.)

7981 ER-8098

Martin (Glenn L.) Co., Baltimore.

POLYPHENYLS LITERATURE SEARCH. Edward H. Smith. Mar. 1956. 61p.

A literature search was made in order to find a polyphenyl that could be used as moderator or coolant in fission reactors. Possible use as secondary coolants in Na or KNa cooled reactors was also investigated. (W.L.H.)

7982 HW-36422

Hanford Atomic Products Operation, Richland, Wash.

CARBON STEEL PROGRAM FOR HIGH TEMPERATURE REACTOR SYSTEMS. W. L. Pearl. Apr. 27, 1955. Changed from OFFICIAL USE ONLY May 29, 1956. 12p. Contract [W-39-109-Eng-52]. $3.30(ph OTS); $2.40 (mf OTS).

The possibility of substituting carbon steel for stainless steel in reactor structures has been suggested, and an economic study indicates the desirability of the substitution. The necessary information on carbon steel behavior under reactor conditions before its use becomes feasible is discussed, available useful information is noted, and a program of research is suggested. (D.E.B.)

7983 IDO-16291

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MTR TECHNICAL BRANCH QUARTERLY REPORT [FOR] FIRST QUARTER, 1956. W. P. Conner, ed. June 8, 1956. 49p. Contract AT(10-1)-205. $0.35(OTS).

The cause of the sporadic boiling in the MTR is attributed to the random accumulation of debris on the top of the reactor which reduced coolant flow. Sample fuel test plates, including powder metallurgy, 20% enriched fuel, burnable poisons, and gradient fuel and poison compositions are being fabricated for future MTR evaluation. Corrosion tests of Al–B alloys are in progress to evaluate this alloy as a cladding containing a burnable poison. Flux distributions are being measured to assess further power increase in the MTR. Critical mass calculations related to control of the reactivity for SPERT-III are presented.

Cross section data for Tm, Cd, and the decay scheme for Ni^{65} are reported. New Soller slits for the crystal spectrometer give resolution better than 0.1 μsec/meter. A 1024-channel energy analyzer using a magnetic core storage system is under construction. (F.S.)

7984 JENER-42

Joint Establishment for Nuclear Energy Research, Kjeller, Norway.

HIGH PRECISION DETECTOR FOR PERIODIC POWER MODULATION IN JEEP. P. Schmid. Jan. 22, 1956. 19p.

The electronic equipment of the pile oscillator system at Kjeller, consisting of a TQT-ionization chamber, a d-c amplifier system and a harmonic analyzer is described. Special attention is paid to high stability of the amplifiers, and a simple calibration device allows frequent over-all checks. A new method is applied to eliminate the influence of mean level drifts on the measured amplitude of the fundamental harmonic. (auth)

7985 KAPL-1527

Knolls Atomic Power Lab., Schenectady, N. Y.

CRITERIA AND METHODS FOR EVALUATING ENVIRONMENTAL REACTOR HAZARDS. J. J. Fitzgerald. Mar. 3, 1956. 42p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

Although nuclear reactors are not at this time inherently safe, the probability of a serious incident is very small. Following an incident in a well-designed pressure-resistant power plant building, it appears most probable that not more than 0.05% long-lived fission products would be released in the environs during 1000 years of reactor operations. The criteria and methods for evaluating nuclear hazards are discussed. A simplified method for determining the magnitude of the hazards with respect to specific population density curves is presented. (auth)

7986 LEO/N-43

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME GENERAL CONSIDERATIONS ON THE OVERALL CONTROL PROBLEM. R. W. Sutton. Apr. 25, 1956. 9p.

Control of LEO may be accomplished by fuel element movement and steam load control. These two control methods are discussed, and equations are developed for their description. (D.E.B.)

7987 NAA-SR-1517

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

TWO-GROUP CALCULATION OF THE CRITICAL CORE SIZE OF THE SRE REACTOR. F. L. Fillmore. July 1, 1956. Contract AT(04-3)-49. $0.30(OTS).

A description is given of the reactor on which the calculations are based. Basic cross sections and other physical data used in the calculation are listed. The required lattice parameters are evaluated, taking into account the details of the lattice cell structure and core structure. Using two-group reflected reactor theory, critical size of the core is calculated for three cases: dry, all materials at 20°C and no Na in the reactor; wet, Na present and all materials at 180°C; hot, operating at full power. The flux and adjoint flux is given in both radial and axial directions. Several known perturbations are evaluated for the hot case. (auth)

7988 NP-6037

Mine Safety Appliances Co., Callery, Penna.

REMOVAL OF ENTRAINED GAS FROM A SODIUM SYSTEM. Technical Report No. 50. K. R. Barker and J. W. Mausteller. July 12, 1956. 14p. Contract NObs-65426.

An efficient method for removal of entrained gas in a Na system similar to the S2G primary coolant system is described. A study of the behavior of air-water mixtures in a glass loop showed how gas moved through the system and gave a better understanding of two-phase flow. Air could be held up at various points depending on the velocity: down-stream end of upper horizontal run at 0.25 fps, in the vertical downward leg at 0.25 to 0.50 fps, and at the bottom of the vertical downward run at 0.50 fps. Entrained gas in the Na system caused erratic flowmeter and pump performance and flow stoppage at low velocities. An expansion tank located above the loop will remove gas at any flow condition great enough to transport gas to the vent. If it is necessary to transport gas downward to the expansion tank a minimum velocity must be exceeded. This was found to be between 1.5 and 2.3 fps in a 1 in. line 6 ft long. Gas removal rate is a function of velocity in the expansion tank line, but is independent of the main loop velocity. Entrained gas can be removed if liquid velocities are kept above 2 ft/sec and a normal separator is used in a by-pass line. (auth)

7989 ORNL-2087

Oak Ridge National Lab., Tenn.

CRITICAL EXPERIMENTS AND NUCLEAR SAFETY AT OAK RIDGE NATIONAL LABORATORY. A. D. Callihan. Aug. 2, 1956. 10p. Contract W-7405-eng-26. $0.15(OTS).

This paper considers two somewhat separate aspects of potential hazards in the nuclear reactor program. The first section describes the safety features of the critical-experiments program at Oak Ridge National Laboratory and reviews its operational experience. In these experiments, reactor prototypes are studied and the problems of fuel processing are examined. The second section of the paper presents some design bases for fuel processing equipment and discusses the administration of nuclear safety at the Laboratory. (auth)

7990 ORNL-2088

Oak Ridge National Lab., Tenn.

OPERATIONAL SAFETY OF THE HOMOGENEOUS REACTOR TEST. P. R. Kasten. July 19, 1956. 33p. Contract W-7405-eng-26. $0.30(OTS).

The safety of the Homogeneous Reactor Test (HRT) is dependent upon the reactivity additions associated with physical operations. Physical operations were therefore limited, where necessary, so that the corresponding reactivity addition did not exceed a permissible value. The maximum permissible reactivity addition was determined from the relations between reactivity addition, physical and nuclear design values, and pressure rise and was considered to be that which increased the core pressure by 400 psi. At source power this pressure rise would be obtained if reactivity were added at a rate of 0.008 Δk_e/sec. The above relations are presented, and their usefulness in evaluating operational safety is illustrated. (auth)

7991 WAPD-142

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

COMPUTATION OF PARAMETERS APPEARING IN THE REACTOR KINETICS EQUATIONS. A. F. Henry. Dec. 1955. 55p. Contract NObs-67500.

The reactor kinetics equations are obtained from the time dependent transport equation by assuming separability of the time dependence and applying suitable adjoint functions. The quantities reactivity, effective delayed neutron fraction, and prompt neutron lifetime are defined by this process in terms of integrals of directional fluxes and adjoint functions over angle space and energy. A reduction to diffusion theory and group theory is then carried out, and techniques for computing reactivity coefficients and effective values of the delayed neutron fractions are discussed. (auth)

7992 WAPD-S5W-EP-15

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

IRRADIATION OF PLASTIC FUEL TAPES. PART V.

Phyllis A. Nicoll. Feb. 1956. 22p. Contract NObs-67500.

Previous reports in this series are WAPD-PM-1, WAPD-P-656, WAPD-P-659, and WAPD-P-687. The current tests include a continuation of the study of the effect of He pressure upon the expansion of unclad polyethylene fuel tape. Irradiations under pressures of 10, 25, and 50 psig show that increased pressure results in decreased expansion, but that the greatest limitation of expansion is produced by the first 10 to 25 psi. Unclad polyethylene tape irradiated at atmospheric pressure shows the same expansion characteristics as the standard tape, although expansion begins at a lower value of integrated thermal flux $(nvt)_{th}$, and consequently is greater at any given $(nvt)_{th}$ value. Au foil flux monitors give an average thermal flux in BNL PN-4 of 1.94×10^{12} neutrons/cm^2-sec at 25 Mw with an average Cd ratio of 3.84. (auth)

7993

DESIGN COMPARISON OF REACTORS FOR RESEARCH. L. B. Borst (New York Univ., University Heights). Ann. Rev. Nuclear Sci. 5, 179-96(1955).

The following design criteria of several research reactors are discussed: neutron flux, neutron energy, research capacity, cost, fuel, moderators, coolant, and safety. (C.W.H.)

7994

THE PRESSURIZED WATER REACTOR AS A SOURCE OF HEAT FOR STEAM PLANT. II. J. M. Kay and F. J. Hutchinson. Atomics 7, 91-6(1956) Mar.

The pressurized water reactor is examined from the viewpoint of the power engineer, and some of the various ways in which it could be employed as a source of heat for a steam power station are considered. (auth)

7995

ATOMIC POWER FOR OIL TANKERS. POSSIBLE APPLICATION IN MARINE TANKER VESSELS. Atomics 7, 97-9 & 110(1956) Mar.

Details are given of the possible application of nuclear energy power plants to the propulsion of marine tanker vessels. In addition to a technical summary of the power plant, some economic features are surveyed. (auth)

7996

CONCEPTUAL DESIGN FOR INTERNALLY COOLED LMFR. Robert J. Teitel (Brookhaven National Lab., Upton, N. Y.). Nucleonics 14, No. 4, 72-7(1956) Apr.

A conceptual design is given of the internally cooled, liquid metal fuel reactor which includes breeder and coolant functions in one stream. The design characteristics are also tabulated. Single-pass graphite heat exchangers were used in the design, and core size and the Bi-to-C ratio were determined by heat-transfer requirements. Fuel processing systems and the breeder-coolant system are also described in some detail. (B.J.H.)

7997

TWO VIEWPOINTS ON CONTROLLING BOILING REACTORS. R. Philip Hammond (Los Alamos Scientific Lab., N. Mex.) and John MacPhee (American Machine and Foundry Co., Greenwich, Conn.). Nucleonics 14, No. 4, 106, 108-9(1956) Apr.

The desirability of compromising the basic simplicity of boiling reactors to ease the control problems is discussed. (B.J.H.)

7998

FINDING THE BUCKLING OF AN ELLIPTIC CYLINDER. Paul F. Gast and Anthony Bournia (Hanford Atomic Products Operation, Richland, Wash.). Nucleonics 14, No. 4, 109-13(1956) Apr.

Equations are given for reactors in the form of a right elliptic cylinder. These are particularly applicable to a propulsion reactor which might be mounted in a space where one horizontal dimension must be limited. (B.J.H.)

Refer also to abstracts 7589, 7607, and 7621.

NUCLEAR TRANSFORMATION

7999 AERE-M/M-119

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

POLONIUM PRODUCTION AND DECAY IN A BISMUTH REACTOR SYSTEM. W. H. L. Porter. June 1956. 7p. (LMFP/P3).

8000

METHODS OF DETERMINING THE ABSOLUTE FAST NEUTRON FLUX AND THE EFFECTIVE CROSS SECTION OF A NUCLEAR REACTION WITH NEUTRON EMISSION BY PHOTOGRAPHIC TECHNIQUES. J. Catalá, J. Aguilar, F. Senent, and R. Font. Anales real soc. espãn. fis. y quim. (Madrid), Ser. A 52A, 33-42(1956) Jan.-Feb. (In Spanish)

Following the photographic technique, a method is presented for calculating both the absolute neutron flux and the cross section for a nuclear reaction with neutron emission. This method is applied to the results in the study of $Li^7(d,n)Be^8$ reaction, for the ground state of Be^8. (auth)

8001

ON DOUBLE ALLOWED β TRANSFORMATION. B. S. Djelepov and L. K. Peker. Doklady Akad. Nauk S.S.S.R. 106, 626-9(1956) Feb. 1. (In Russian)

The β transformation probability depends on the variation of the total momenta in the ΔI system, on the variation of the wave function in the Δd system, and on the variation of the orbital momenta of the ΔL system. The β transformation is solved for the cases where variation of these magnitudes are within the definite limit governed by the selective rule, while for the cases where ΔI, Δd, and ΔL variations are beyond these limits, the β tramsformation relates to the forbidden ones. Calculations are made to find all the factors which prohibit the β transformation and determine the differences in log ft values in transformations where ΔI, Δd, and ΔL are known to be equal. Correlation of log ft values in β transformation with equal ΔI, Δd, and ΔL are set up for the cases of competing $\beta^+ - \beta^-$ decays in nuclei of even parity A and odd Z, and for cases of successive β decays in isobaric triplets in which the mean isobar has an even parity A and an odd Z. In both cases the end isobars are nuclei with an even parity A and an odd Z. Data for all 21 cases analyzed for both types of decay showed that binary bound β decays have similar prohibiting order. Correlations of log ft for binary bound β decay established a rule that if one of the ground nuclei has a complete proton or neutron shell the log ft value is smaller in transformations related to such nuclei than the log ft in transformations of the one which does not possess the complete shell. The table of β transformation of types $0^+ \leftarrow X \rightarrow 0^+$, and $0^+ \rightarrow X \rightarrow 0^+$, and the relation of deformation coefficient to the number of nucleons in the complete shell are discussed. (R.V.J.)

8002

LIMITS TO SOME (n,np) CROSS-SECTIONS AT 14.5 MEV NEUTRON ENERGY. A. V. Cohen, S. B. Hyder, and P. H. White (Imperial Coll., London). Nuclear Phys. 1, No. 4, 278-80(1956).

Upper limits for reaction cross sections in Si^{30}, Pd^{108}, Ce^{142}, and W^{186} (n,np) reactions were established at 0.8, 65, 18, and 1.6 mbn. (D.E.B.)

8003

INVESTIGATION OF DEUTERON INDUCED REACTIONS BY MAGNETIC ANALYSIS. II. RESULTS FOR Be^9, C^{12}, N^{14},

AND O^{16}. T. S. Green and R. Middleton (Univ. of Liverpool, England). Proc. Phys. Soc. (London) A69, 28-42(1956) Jan. 1.

Angular distributions have been measured of some of the proton, deuteron and α-particle groups emitted from targets of beryllium, carbon, nitrogen and oxygen when bombarded by 9 Mev deuterons. The proton angular distributions have been compared with those calculated from the stripping theories enabling assignments of spins and parities to be made to levels of the residual nuclei. Calculations have also been made of the relative capture probabilities and reduced widths and in the cases of carbon and nitrogen it was possible to express them in absolute units. (auth)

8004

EXCITATION FUNCTIONS UP TO 980 MEV FOR PROTON-INDUCED REACTIONS IN ^{27}Al, RELATIVE TO $^{12}C(p,pn)^{11}C$. G. A. Chackett, K. F. Chackett, P. Reasbeck, J. L. Symonds, and J. Warren (Univ. of Birmingham, England). Proc. Phys. Soc. (London) A69, 43-8(1956) Jan. 1.

The activities produced in the bombardment of Al with protons in the energy range 200 to 980 Mev have been studied. The ratio of the cross section for the production of C^{11} from polythene to that for both F^{18} and Na^{24} from Al are given in this energy range while cross section ratios of Mg^{27}, N^{13} and C^{11} from Al are given at an energy of 980 Mev. (auth)

8005

THE PHOTODISINTEGRATION OF NITROGEN. I. F. Wright, D. R. O. Morrison, J. M. Reid, and J. R. Atkinson (Univ. of Glasgow, Scotland). Proc. Phys. Soc. (London) A69, 77-92 (1956) Feb. 1.

The (γ, p), (γ, pn), (γ, α), (γ, $\alpha\alpha$) and (γ, αp) reactions in N^{14} have been studied by passing the x-ray beam from a 23 Mev synchrotron through a Wilson cloud chamber. The range distribution of protons of energy up to 3 Mev shows sharp well-defined peaks at energies of 0.51, 1.63 and 2.92 Mev. These energies correspond closely to the energies of the resonances reported for the $C^{13}(p, \gamma)N^{14}$ (ground state) reaction. For these resonances the ratios of the cross sections for the (γ, p) and (p, γ) reactions are in good agreement with the predictions of the principle of detailed balancing. At higher energies the following measurements were made: (i) the (γ, p) process was investigated by measuring the range distribution of the C^{13} nuclei, (ii) both (γ, p) and (γ, pn) processes were studied by measuring the numbers of events at three different synchrotron peak energies. These measurements showed that both the (γ, p) and (γ, pn) cross sections are small at energies up to 15 Mev and large in neighbourhood of 20 Mev. The estimated values of the integrated cross sections up to 23 Mev for the (γ, p) and the (γ, pn) reactions are both approximately 0.02 Mev barn. The (γ, α), (γ, $\alpha\alpha$) and (γ, αp) cross sections are each about 0.1 millibarn. The implications of these results are discussed in some detail. (auth)

8006

OBSERVATIONS OF THE NUCLEAR INTERACTIONS OF A 315 MEV BREMSSTRAHLUNG γ-RAY BEAM. E. P. George (Univ. of Sydney, Australia). Proc. Phys. Soc. (London) A69, 110-24(1956) Feb. 1.

The γ-ray beam was incident normally on Ilford G5 nuclear research emulsions, and events occurring in the emulsion were studied. The events have been analysed, and particular attention paid to interactions in which charged mesons leave tracks of length greater than 1.5 mm at right angles to the γ-ray beam. About 50% of the observed photomesons are not accompanied by visible nuclear disintegration 'star'. The energy spectrum of the emulsion photomesons has been measured. The ratio of stars to mesons is found to be 11.4 : 1. These results are all consistent with a theoretical model proposed by Butler, in which meson production is considered to take place preferentially on the surface of atomic nuclei. Several high-energy electrons and electron-pairs moving at right angles to the γ-ray beam have been observed, and are accounted for. The observed cross section for the production of stars with three or more prongs is 2.9×10^{-27} cm^2 nucleus $^{-1}Q^{-1}$ in agreement with the result of Miller and disagreement with that of Kikuchi. The relation of these results to observations of the electromagnetic excitation of nuclei by fast charged particles is considered. (auth)

8007

MEASUREMENT OF γ-TRANSITION LIFETIMES BY RECOIL METHODS. II. M1 TRANSITIONS IN ^7Li AND ^7Be. D. St. P. Bunbury, S. Devons, G. Manning, and J. H. Towle (Imperial Coll., London). Proc. Phys. Soc. (London) A69, 165-72(1956) Feb. 1.

The methods described in a previous paper have been applied to the measurement of the mean lifetimes of the first excited states of the mirror nuclei Li^7 and Be^7. The experimental results are, respectively, $7.7 \pm 0.8 \times 10^{-4}$ sec and $2.7 \pm 1.0 \times 10^{-13}$ sec. The accuracy of these results is limited, particularly in the latter case, by inadequate knowledge of the range–velocity relationship for these nuclei in their passage through solid materials. (auth)

8008

MEASUREMENT OF γ-TRANSITION LIFETIMES BY RECOIL METHODS. III. E2 TRANSITIONS IN SOME EVEN-EVEN NUCLEI. S. Devons, G. Manning, and J. H. Towle (Imperial Coll., London). Proc. Phys. Soc. (London) A69, 173-7(1956) Feb. 1.

The mean lives of the first 2^+ states of C^{12}, O^{16}, Ne^{20}, and Si^{28} have been measured using recoil methods with following results: C^{12}, $\tau = 2.6 \pm 0.9 \times 10^{-14}$ sec.; O^{16}, $\tau \lesssim 2.5 \times 10^{-14}$ sec.; Ne^{20}, $\tau = 7.6 \pm 3.3 \times 10^{-13}$ sec.; Si^{28}, $9 \times 10^{-13} \lesssim \tau$ (or $\tau \lesssim 3 \times 10^{-14}$). (auth)

8009

PHOTONUCLEAR YIELDS FROM ARSENIC AT 140 MEV AND 320 MEV. T. T. Sugihara and I. Halpern (Massachusetts Inst. of Tech., Cambridge). Phys. Rev. 101, 1768-71 (1956) Mar. 15.

Yields of a number of radioactive nuclei produced by synchrotron irradiations of arsenic have been determined at two energies, 140 Mev and 320 Mev. By comparing the yields at both energies to each other and to other data, it is possible to show that the (γ,3n) and (γ,αn) reactions proceed predominantly by the absorption of a photon to form an excited compound nucleus from which particles are emitted by evaporation. On the other hand, reactions in which more than one charged particle is emitted are often produced by photons having much more energy than would be required for particle evaporation. The average cross section for the production of a number of such nuclides by photons of energy between 140 and 320 Mev has been measured. For some gallium and copper isotopes the cross section is as large as a few tenths of a millibarn. (auth)

8010

TRANSMUTATIONS OF LIGHT NUCLEI. EXPERIMENTAL DETERMINATIONS OF REACTION ENERGIES, ATOMIC MASSES AND ANGULAR DISTRIBUTIONS. Katarina Kraft Ahnlund (Nobel Inst. of Physics, Stockholm). Uppsala, Almqvist and Wiksells Boktryckeri AB, 1956. 9p.

Experimental work on the transmutation of light nuclei is reviewed. (B.J.H.)

Refer also to abstracts 7842 and 7936.

PARTICLE ACCELERATORS

8011 AECU-3129

Stanford Univ., Calif. Microwave Lab.

DEVELOPMENT OF HIGH-POWER MODULATORS WITH LOW-VOLTAGE COMPONENTS. C. B. Jones and R. B. Neal. Dec. 1955. 22p. Contract AT(04-3)-21. (ML-288). $0.25(OTS).

Modulators capable of producing pulses in the range of 100 Mw and with pulse lengths from 1 to 3 μsec for large klystron amplifiers and a fixed spark-gap type switch with provisions for external triggering were developed. (F.S.)

8012 CERN-PS/MM-23

[European Council for Nuclear Research, Geneva. Proton Synchrotron Group.]

INTEGRATEUR ELECTRONIQUE POUR LES MESURES DYNAMIQUES DU CHAMP MAGNETIQUE ET DE SON GRADIENT. (Electronic Integrator for Dynamic Measurements of the Magnetic Field and Its Gradient). Jan. 1956. 21p.

A description is given of an integrator with automatic stabilization. Between two pulses of the proton synchrotron magnetic field, the output voltage of the integrator is set at zero by a servo system. A little after the following pulse this is disconnected and a measurement is accomplished in the following second. The drift at the output during this second is about 10^{-5}/RC V/sec. An integrator of this type will be employed for the measurements on the 1000 masses which will constitute the magnet of the proton synchrotron. (tr-auth)

8013 ISC-647

Ames Lab., Ames, Iowa.

A POSSIBLE METHOD FOR BEAM EXTRACTION FROM AN ALTERNATING GRADIENT SYNCHROTRON. Loren R. McMurray and Daniel J. Zaffarano. Nov. 28, 1955. 31p. Contract W-7405-eng-82.

A mathematical analysis of the effects of perturbations upon the guide field of a circular alternating gradient synchrotron was made to determine the amount and type of perturbation which would make the horizontal motion unstable, but would not affect the vertical motion to the extent that it would become unstable. The purpose of the analysis was to determine if the technique of beam extraction developed by Hammer and Bureau for a conventional synchrotron would apply to an alternating gradient synchrotron. Most of the method of analysis and some of the results will also apply to a circular machine of fifty sectors with fall off indices between the same integral and half-integral resonances as the chosen machine. For circular machines with other fall off indices, the method may be generalized, but the numerical results would have to be recomputed. (auth)

8014 ISC-685

Ames Lab., Ames, Iowa.

MEASUREMENT OF MAGNETIC FIELD GRADIENTS BY THE HALL EFFECT. Robert D. Redin and G. C. Danielson. Dec. 1955. 41p. Contract W-7405-eng-82.

A magnetic field gradient measuring device, which uses the Hall effect in germanium, has been constructed. The field sensitive element is a bar of germanium 1 mm by 1 mm by 12 mm with two sets of Hall leads attached 2 mm either side of its center. One hundred cycle alternating current flows in the long direction of the bar. In a magnetic field two 100 cycle Hall voltages are obtained. These voltages, which are proportional to the magnetic field strength at two points of the field 4 mm apart, are subtracted to give an output directly proportional to the magnetic field gradient. The instrument will also measure field strengths and relative gradients. The instrument was tested in a calculable magnetic field produced by step pole pieces. Gradients from 5 gauss/inch to 500 gauss/inch in magnetic fields below 5000 gauss were measured. The usefulness of the instrument is still uncertain owing to errors caused by excessive field dependence of the gradient voltage. (auth)

8015 LRL-122

California Research and Development Co. Livermore Research Lab., Livermore, Calif.

CHARGE DISTRIBUTION IN THE BEAM OF CHARGED PARTICLES IN A CONSTANT MAGNETIC FIELD. C. S. Gardner. May 1954. Decl. Sept. 29, 1955. 10p. Contract AT(11-1)-74.

The motion of a cylindrical beam of particles in a constant magnetic field is studied. It is assumed that the interaction of the charges can be approximated by two-dimensional electrostatic repulsion. A general equation of motion is derived. A relation between the charge distribution and velocity distribution for the steady state is derived. (auth)

8016 MURA-HRC-1

Midwestern Universities Research Assn., Urbana, Ill. and Michigan. Univ., Ann Arbor.

MAINTAINING THE GEOMETRICAL ALIGNMENT OF A LARGE ACCELERATOR. A Preliminary Theoretical Study. H. R. Crane. Mar. 16, 1956. 14p.

A theoretical investigation on maintaining the geometrical alignment of a very large alternating-gradient-type accelerator finds it possible to check both altitude and radius in a machine of 500-ft radius to well within 0.0014 in. and to do the checking and readjustment operation to within a half-days time. (F.S.)

8017 MURA-LJL-8(Rev.)

Midwestern Universities Research Assn., Urbana, Ill.

PROPOSED METHOD FOR DETERMINING MARK V TRAJECTORIES BY AID OF GRID STORAGE. L. Jackson Laslett. Feb. 21, 1956. 14p.

It has been proposed that the trajectories of particles in an FFAG accelerator of the spirally-ridged (Mark V) type may conveniently be obtained with an electronic digital computer by storage of values from which the fields may be derived. Based on the scaling properties of the assumed structure, the present report suggests suitable coordinates to be used in representing the field, develops the differential equation describing the magnetostatic problem in these coordinates, indicates the means of obtaining the field-components from the solution of this differential equation, and discusses the use of these results in the dynamical equations for the trajectories. Proposed limits for the parameters are indicated, certain cases in which 1/w vanishes being admissible. (auth)

8018 UCRL-3332

California. Univ., Berkeley. Radiation Lab.

BEVATRON OPERATION AND DEVELOPMENT. VIII. [Period covered] November, December 1955, January 1956. Walter Hartsough. Mar. 1, 1956. 31p. Contract W 7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

An account is given of Bevatron accessory developments, and the arrangement of a newly constructed meson experimental facility is shown. (For preceding period see UCRL-3236.) (D.E.B.)

8019

THE STRAY RADIATION LEVELS OF A 45 MeV TRAVELLING WAVE LINEAR ELECTRON ACCELERATOR. C. L. Hsieh (Michael Reese Hospital, Chicago, Illinois). Brit. J. Radiol. 29, 201-4(1956) April.

Measurements of stray radiation from a 45-Mev linear accelerator are described. (C.H.)

8020
AN ANALYSIS OF INJECTION PHENOMENA IN THE BIRMINGHAM PROTON SYNCHROTRON. C. A. Ramm, R. F. Coe, and T. B. Vaughan (Univ. of Birmingham, England). J. Sci. Instr. 33, 102-6(1956) Mar.

Experimental analysis of the injection processes in the Birmingham proton synchrotron shows that the machine accepts particles for the whole of the theoretical time of injection and that the radio-frequency system accelerates only those particles with very small betatron oscillations. Injection with rising energy gives an increase of more than twice the intensity of the machine output compared with constant energy injection. (auth)

8021
SPACE CHARGE AND IONIZATION PHENOMENA IN CONSTANT-GRADIENT PROTON SYNCHROTRONS. P. B. Moon (Univ. of Birmingham, England). Proc. Phys. Soc. (London) A69, 153-6(1956) Feb. 1.

The stability of small oscillations of protons circulating in a synchrotron is investigated on the assumption of a uniform space charge in addition to the magnetic field of constant radial gradient. If the space charge is that of the protons themselves, the greatest number that can be held in a uniform beam of cross section A is $VB_zA/2e$, where V is the velocity of the protons, B_z is the magnetic field on the equilibrium orbit and the units are electrostatic. One third of this number might be held in a bunched beam of 120° azimuthal length, but existing synchrotrons fall far short of this. Consideration is given to the effects of ionization in the residual gas, and to the possibility that the space charge could be neutralized by the continuous injection of electrons. (auth)

8022
THE ACCELERATION OF PROTONS TO ENERGIES ABOVE 10 GEV. M. L. Oliphant. Proc. Roy. Soc. (London) A234, 441-56(1956) Mar. 6.

The need for proton accelerators in the 10 Bev range is discussed, and the characteristics of several accelerator types for meeting this need are reviewed. (D.E.B.)

Refer also to abstracts 7438, 7439, and 7638.

RADIATION ABSORPTION AND SCATTERING

8023 NEVIS-26
Columbia Univ., Irvington-on-Hudson, N. Y. Nevis Cyclotron Labs.
PION-DEUTERON SCATTERING IN THE IMPULSE APPROXIMATION (thesis). Ronald M. Rockmore. Apr. 1956. 51p. Sponsored by ONR and AEC under Contract N6-ori-110, Task No. 1. (CU-111-56-ONR-110-1-Phys.). $9.30 (ph OTS); $3.60(mf OTS).

The pure scattering model of Fernbach, Green, and Watson is used to obtain impulse approximation expressions for the elastic, elastic plus inelastic (closure approximation) π-D differential cross sections. The net interference where p-wave scattering is dominant is found to be constructive; the interference due to charge exchange scattering is always negative. The Coulomb effect gives rise to strong destructive interference in the π^+-D elastic component at 85 Mev (laboratory energy of incident pion) for angles < 45°. The multiple scattering correction as calculated on Brueckner's model is approximately 10% of the free particle cross section and positive. However, a perturbation field-theoretic treatment of the ($\frac{3}{2}$, $\frac{3}{2}$) double scattering indicates that Brueckner's model is unreliable at low energies. The binding correction to the impulse approximation is calculated using a p-state interaction hamiltonian (pv coupling) and found to be −3.2 mb at 85 Mev. The forward peak in the elastic differential cross section is found appreciably reduced by destructive interference arising from elastic "absorptive" scattering. It is concluded that, at energies $\gtrsim$ 100 Mev, absorption corrections are significant, with the multiple scattering correction becoming important at higher energies. (auth)

8024 AERE-Lib/Trans-731
COMPARATIVE INVESTIGATION OF THE ABSORPTION OF MONOENERGETIC POSITRONS AND ELECTRONS IN COPPER AND CADMIUM. K. A. Baskova and V. M. Gorbachev. Translated by T. Turton from Zhur. Eksptl'. i Teoret. Fiz. 26, 270-4(1954). 7p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-415.

8025
ELASTIC SCATTERING (d,p) AND (d,C^{12}) BY 7.86-MEV DEUTERONS. J. Catalá, F. Senent, and J. Aguilar. Anales real soc. espan. fis. y quim. (Madrid), Ser. A 52A, 27-32 (1956) Jan.-Feb. (In Spanish)

A technique described in earlier papers has been applied to the study of the angular distributions of the elastically scattered protons from 7.86-Mev deuterons. The differential cross section is expressed as a series in Lengendre polynomials. In this note an earlier paper on the angular distribution in the center-of-mass system of deuterons elastically scattered from C^{12} is completed. (auth)

8026
THE ELASTIC AND INELASTIC SCATTERING OF FAST NEUTRONS. III. W. D. Allen (Atomic Energy Research Establishment, Harwell, Berks, England). Atomics 7, 103-8(1956) Mar.

It has been shown that a study of total and elastic scattering gave results of interest because of the support they gave to the complex potential model of the nucleus. A study of neutron inelastic scattering is, so far, not so complete: neutron spectrometers, by and large, are still in the process of development. However, considerable progress has been made with the study of γ rays from inelastic scattering, with time of flight studies, with sphere transmission and by various other methods. These developments are described. (auth)

8027
THEORETICAL INTERPRETATION OF THE ANOMALOUS SCATTERING OF X RAYS BY CRYSTALS. Yvonne Heno. Compt. rend. 242, 1599-1602(1956) Mar. 19. (In French)

First results are given on a general quantum theory of coherent atomic scattering. It is applied to x rays, and approximate numerical results are given for x-ray scattering by quartz in the neighborhood of the K absorption frequency of Si. (tr-auth)

8028
VARIATION OF p-p SCATTERING CROSS SECTION WITH ENERGY. Yatendra Pal Varshni (Allahabad Univ., India). Naturwissenschaften 43, 123-4(1956) Mar. (In English)

The empirical formula $d\sigma = 112.5/(E + .12) + 2.6$ is given for the variation of the p-p scattering cross section with energy. E is the energy of the incident protons, and the constants are in the c.m. system. (B.J.H.)

8029
t-t ELASTIC SCATTERING FROM 1.6 TO 2.0 MEV. Dale M. Holm and H. V. Argo (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 101, 1772-9(1956) Mar. 15.

A magnetically analyzed triton beam from an electrostatic accelerator has been scattered from tritium in a 14-inch scattering chamber and the differential cross section for elastic scattering measured in 10° steps from 20° to 140° in the center-of-mass system for incident energies of 1.8 and 2.0 Mev. Two proportional counters with a fixed angular separation of 90° were used in coincidence to detect both the scattered and recoil tritons for the laboratory range

from 45° to 70°, with an absolute probable error of ±3%. A single counter was used for laboratory angles between 10° and 20°, with resultant probable errors of +5%, −15%. Excitation functions in 100-kev steps from 1.6 to 2.0 Mev show no evidence for an excited state of He^6 in this region. (auth)

8030

INELASTIC DIFFRACTION PROCESSES AT HIGH ENERGIES. E. L. Feinberg. Uspekhi Fiz. Nauk 58, 193-230 (1956) Feb. (In Russian)

Particle collisions at 10^8 ev and higher energy levels are discussed. Electromagnetic bremsstrahlung, π meson pair formation by γ quanta, splitting of fast deuterons, and other inelastic diffraction processes are analyzed and reviewed. (R.V.J.)

8031

CONSIDERATION OF THE NUCLEAR QUADRUPOLE MOMENT IN ELECTRON SCATTERING. V. A. Miamlin (Moscow Engineering-Physical Inst.). Soviet Phys. JETP 2, 163-5(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 28, 756-8(1955) June. (In Russian)

An estimation is made of the influence of the nuclear quadrupole moment on the elastic scattering of electrons by nuclei. (B.J.H.)

8032

NUCLEON-NUCLEON SCATTERING ACCORDING TO THE THEORY OF DAMPING. G. F. Zharkov (P. N. Lebedev Inst. of Physics, U.S.S.R.). Soviet Phys. JETP 2, 55-8(1956) Jan. (In English). Zhur. Eksptl.' Teoret. Fiz. 29, 85-8 (1955) July. (In Russian)

Nucleon-nucleon scattering cross sections have been calculated on the basis of the theory of damping. It is shown that the calculated dependence of the total cross sections on the energy cannot be made to agree with experiment. (auth)

Refer also to abstract 7920.

RADIATION EFFECTS

8033 NP-5939

Penn-Texas Corp., New York.

EFFECT OF IRRADIATION ON SOLIDS. A BIBLIOGRAPHY (2ND EDITION). Helen C. Friedemann, comp. Mar. 30, 1956. 29p.

8034

THE EFFECT OF REACTOR IRRADIATION ON ELECTRICAL INSULATION. J. C. Pigg, C. D. Bopp, O. Sisman, and C. C. Robinson (Oak Ridge National Lab., Tenn.). Communication and Electronics, No. 22, 717-23(1956) Jan.

The presence of a radiation field subjects the insulation of a circuit to environmental conditions which both accelerate the normal processes of deterioration and introduce new characteristics to the insulation behavior. The resistance of an insulation under irradiation drops to some value which is a function of the flux level and maintains this value as irradiation proceeds. Eventually the insulation resistance begins to drop again. This final resistance drop can be designated the breakdown of the insulation. The breakdown irradiation dosage for several insulations studied is shown. The change in insulation resistance in the presence of a field is greater than that caused by chemical deterioration since the ionization provides mobile charges which are available for conduction. These charge carriers give to the insulation properties similar to a semiconductor and result in the nonohmic resistance as well as photovoltages. These photovoltages change in sign and magnitude depending on the sign of the charge carrier. Voltages as high as 200 volts have been observed in commercially available wires. The nonohmic and photovoltage effects can be minimized by proper geometrical arrangement of the insulation. (auth)

8035

FIXATION OF NITROGEN BY IONIZING RADIATION AS NITROGEN DIOXIDE AND NITROUS OXIDE. P. Harteck and S. Dondes (Rensselaer Polytechnic Inst., Troy, N. Y.). J. Chem. Phys. 24, 619(1956) Mar.

The production of nitrogen dioxide and nitrous oxide from reactor irradiation of N_2-O_2 mixtures is shown to be dependent on temperature, pressure, radiation intensity, and composition of mixture. A reaction mechanism is proposed. (C.W.H.)

8036

EFFECT OF RADIATION ON A LUCITE RADIUM APPLICATOR. Bernice B. Borrman and Martin Van Herik (Mayo Clinic and Foundation, Rochester, Minn.). Nucleonics 14, No. 4, 96(1956) Apr.

Refer also to abstract 8037.

RADIOACTIVITY

8037 TID-5221

Mound Lab., Miamisburg, Ohio.

POLONIUM. Harvey V. Moyer, ed. 1955. Decl. Oct. 12, 1955. 402p. $1.75(OTS).

A survey was made of γ, α, and x radiations associated with the decay of Po^{210}. The nuclear, physical and chemical properties of Po are analyzed. Chemical separation methods and separation by distillation are studied for extraction of Po from irradiated Bi. Polonium from Pb residues and neutron and alpha sources are described. Biological research related to Po and health physics concerning with personnel protection and waste disposal are discussed. (R.V.J.)

8038

STUDIES ON SOME ORBITAL CAPTURES. Paul Avignon. Ann. phys. (13) 1, 10-56(1956) Jan.-Feb. (In French)

A review of the theory of β radioactivity is given, including discussions of selection rules, orbital electron capture, the K capture/β^+ ratio, atomic rearrangement, and internal conversion. The principles of various experimental techniques for studying orbital captures are also reviewed. These methods include proportional counter, scintillation spectrometer, magnetic lens spectrometer, and coincidence techniques. The application of these methods to the study of various nuclides such as Zn^{65}, Pd^{103}, Sn^{113}, and Rh^{102}, is also discussed. (B.J.H.)

8039

CONTRIBUTION TO THE STUDY OF NUCLEAR DISINTEGRATION BY ELECTRON CAPTURE. THE CASE OF Ba^{133} AND Ge^{71}. Michel Langevin. Ann. phys. (13) 1, 57-98 (1956) Jan.-Feb. (In French)

The scintillation counter and proportional counter are shown to be perfectly adapted to the study of nuclei which disintegrate by electron capture. Using these instruments, it was possible to propose a decay scheme for Ba^{133} and to deduce from quantitative measurements obtained with two scintillation counters in coincidence that the electron capture of Ba^{133} is primarily L capture. The scintillation counter study of the γ radiation associated with the capture of Ge^{71} gives the value $W_o + W_k = 226$ kev for the transition energy and shows the possibility of the existence of an activity by pure electron capture of about a 14 day half life in Ge irradiated by slow neutrons. The proportional counter study of the L/K capture ratio of Ge^{71} gives a value of 0.30 ± 0.02 for the ratio. This result, distinctly higher than the theoretical value of 0.1 deduced from the transition energy, confirms the already verified disagreement for Kr^{79}. Such a disagreement can be explained either by an inexact value of the fluorescence coefficient R_K predicted

by Burhop's theory or by a generalization contrary to the idea of individual states of electrons in the shell. It would seem that this last point should be taken into consideration in studies relative to electron capture. (tr-auth)

8040

STUDY OF β SPECTRA FORMS AND DETERMINATION OF NUCLEAR LEVEL SCHEMES IN THE CASES OF Br^{80}, Rb^{86}, AND Rh^{105}. Jeanne Laberrigue-Frolow. Ann. phys. (13) 1, 152-206(1956) Jan.-Feb. (In French)

8041

L AUGER ELECTRONS ACCOMPANYING THE DECAY OF THE ELEMENTS FROM AN ACTIVE THORIUM SOURCE. Andre Moussa and Jean-Baptiste Bellicard. Compt. rend. 242, 1156-9(1956) Feb. 27. (In French)

A study with a double focusing spectrometer was made of the spectrum of L Auger electrons emitted by the active deposit of Th. Uniform radioactive sources were prepared on 10 $\mu g/cm^2$ formvar. A determination was made of the number of L Auger electrons emitted per disintegration. The energies were determined and some 20 rays arising from L vacancies in the L_{II} and L_{III} subshells of Bi and the L_{III} subshell of Tl were identified. (tr-auth)

8042

RADIOACTIVE DISCHARGE FROM A HOLE AT THE SUMMIT OF THE PUY-DE-DÔME. Hubert Garrigue and Albert Perrin. Compt. rend. 242, 1345-6(1956) Mar. 5. (In French)

A hole 10 cm in diameter and naturally formed in the layer of snow was discharging 400 to 800 $\times 10^{-16}$ curie/cm^3 of radioactive warm air (+3°C). (tr-auth)

8043

USE OF β^- ABSORPTION CURVES FOR THE DETERMINATION OF THE ENERGY OF THE RAYS AND THE IDENTIFICATION OF CERTAIN RADIOACTIVE SUBSTANCES. Marguerite Perey and Christiane Baltzinger. Compt. rend. 242, 1446-9(1956) Mar. 12. (In French)

A comparison was made of β absorption curves as a function of the experimental conditions. The superficial mass A 1/2 absorbing half the radiation in the region between 20 and 2% of the initial activity was determined. A determination was made of the ratio between the energy E_{max} (Mev) and the coefficient A 1/2 (g/cm^2 Cu). The use of these results is discussed. (tr-auth)

8044

AN UNUSUALLY RADIOACTIVE FOSSIL FISH FROM THURSO, SCOTLAND. S. H. U. Bowie and D. Atkin (Geological Survey and Museum, London). Nature 177, 487-8 (1956) Mar. 10.

8045

MOLECULAR EXCITATION IN BETA DECAY. Murray Cantwell (Washington Univ., St. Louis). Phys. Rev. 101, 1747-56(1956) Mar. 15.

The theory of molecular excitation in beta decay is developed for the general case of a polyatomic molecule. Calculations of the daughter molecule vibrational excitation are carried through for diatomic molecules, and the results are presented graphically. Finally, the formation of the $(He^3H^3)^+$ molecule ion in the decay of one nucleus of a tritium molecule is studied in detail. It is concluded that the $(He^3H^3)^+$ ground electronic state vibrational spectrum should be observable in the light spontaneously emitted by tritium. For example, neglecting nonradiative transitions, one expects approximately 10^{14} photons per second to be radiated at wave number $\cong 2.35 \times 10^3$ cm^{-1} by every gram of tritium in the 1→0 vibrational transition. (auth)

8046

DECAY OF Sb^{127} AND Sb^{129}. M. C. Day, Jr. and A. F. Voigt (Iowa State Coll., Ames.). Phys. Rev. 101, 1784-6(1956) Mar. 15.

The techniques of scintillation spectrometry have been applied to the study of the decay of Sb^{127} and Sb^{129}. Both decays were found to be too complex to permit complete analysis in the present experiments, but a number of beta- and gamma-ray transitions were measured for each nuclide. In the decay of 93-hour Sb^{127} three beta-ray groups and eight gamma-ray transitions were measured. Coincidences were observed among several pairs of these transitions. In the 9.2-hour Sb^{129} four gamma rays were observed and measured, and the end-point energy of the most energetic beta transition was determined. (auth)

8047

A HIGH ENERGY GAMMA RAY IN THE DECAY OF BARIUM 131. R. K. Gupta and S. Jha (Tata Inst. of Fundamental Research, Bombay, India). Proc. Phys. Soc. (London) A69, 70-1(1956) Jan. 1.

A scintillation spectrometer was used to study the γ rays of Ba^{131}, and resultant γ spectra are shown. These studies show a γ ray at 1050 ± 15 kev. (B.J.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

8048

THE STRUCTURES OF THE GROUND MULTIPLETS OF CERTAIN RARE-EARTH IONS. B. R. Judd (Clarendon Lab., Oxford, England). Proc. Phys. Soc. (London) A69, 157-64(1956) Feb. 1.

Departures from the Landé interval rule in the ground multiplets of certain rare-earth ions are examined. It is found that magnetic spin–spin interactions between the 4f electrons are much too small to account for the apparent distortions, but that by allowing for the partial breakdown of Russell–Saunders coupling it is possible to obtain satisfactory agreement between experiment and theory. Values of the spin–orbit constant ζ are given for several rare-earth ions, and the positions of a number of excited multiplets are tabulated. (auth)

SHIELDING

8049 AD-46097

Purdue Univ., Lafayette, Ind.

EXPERIMENTAL INVESTIGATION OF THE WATER-TANK RADIATION SHIELD OF THE PURDUE CYCLOTRON (thesis). Clarence William Orr. May 1954. 50p.

Recent modification of the Purdue cyclotron, resulted in an increase in beam current, and the radiation field outside the water-tank shield has been investigated to determine the effectiveness of the shield. The fast neutron dose rate was measured with a proton recoil proportional counter; the slow neutron flux was calculated from the counting rate obtained with a BF_3 proportional counter; and the γ ray dose rate was determined from the counts recorded using a Geiger-Müller counter. Results presented are representative of typical cyclotron operating conditions, and show the present water-tank shield to be an effective radiation shield when accelerating alpha particles, for both internal and external targets and for internal irradiation with deuterons. For external bombardments with deuterons the shield has been found to be effective for neutrons, except at the cracks around the rolling tank on the north side. Future shielding in this area will help to eliminate this hazard. The shield is not adequate on the north side for γ rays. The addition of boric acid into the water tanks should reduce the γ-ray intensity by about 25%. (auth)

8050 AERE-R/R-1963

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

HEAT RELEASE IN CONCRETE REACTOR SHIELDS. D. B. Halliday. Nov. 17, 1954. Decl. May 15, 1956. 18p. (SWP/P-31).

Declassified version of SWP/P-11.

The heating in a reactor shield is due to a mixture of fast neutron, thermal neutron, and gamma irradiation, and once it has been split up into these separate groups, the heat released and temperature attained can be readily calculated by the above method. With the curves of temperature attained, due to a heat input of 1 mw/cm^2, a temperature distribution due to a mixture of fast, thermal neutrons and gammas of any intensity can be calculated and plotted. Experiments carried out in BEPO suggest that a concrete shield would have an irradiation life of at least 10 years in a flux of 10^{11} n/cm^2 sec. (auth)

8051

NUCLEAR RADIATION SHIELDING. E. P. Blizard (Oak Ridge National Lab., Tenn.) Ann. Rev. Nuclear Sci. 5, 73-98(1955).

Radiation attenuation processes and neutron and γ sources are reviewed. Calculations of attenuation in simple homogeneous shields and associated problems of shield design are presented. 90 references. (C.W.H.)

SPECTROSCOPY

8052 CI/R-92

Gt. Brit. Ministry of Supply. Chemical Inspectorate, London.

EXPERIMENTS WITH A BAUSCH AND LOMB ECHELLE-TYPE GRATING. PART I. PERFORMANCE IN A 1.6 METRE LITTROW MOUNTING. F. W. J. Garton and R. A. Mostyn. Dec. 1954. 12p. (WAD/R-124).

The performance of a Bausch and Lomb grating of the echelle type has been assessed when used in a temporary Littrow mounting of 1.6 meters focus. When suitably masked, a resolving power approaching the theoretical value has been obtained but opportunity has not yet occurred of extensively testing it at full aperture. The experiments have made it possible to design a mounting of 3-meter focus utilizing the whole of the ruled surface. (auth)

8053

THE $M_{IV,V}$ SPECTRA OF ^{68}Er. E. A. Stewardson and J. E. Wilson (Univ. Coll. of Leicester, England). Proc. Phys. Soc. (London) A69, 93-101(1956) Feb. 1.

The M_{IV} and M_V absorption spectra of Er_2O_3 have been studied in detail and a careful comparison made with the Mα, β emission lines. The M_V absorption spectrum possesses a number of well-defined absorption maxima. It is shown that the minima between these maxima coincide closely with components of the Mα multiplet and it is suggested that the main components of the emission line previously observed by Van der Tuuk and by Lindberg are not real but are produced by self-absorption in the target material. The line is probably accompanied by one or more real satellites however. The M_{IV} absorption spectrum is much weaker, but probably possesses a number of maxima also. The Mβ emission line probably possesses a satellite, but its form appears to be influenced by self-absorption. (auth)

8054

LAMB SHIFT OF THE 1^2S GROUND STATE OF DEUTERIUM. G. Herzberg (National Research Council, Ottawa, Canada). Proc. Roy. Soc. (London) A234, 516-28(1956) Mar. 6.

According to modern quantum electrodynamics, the 1S level (ground state) of H and D is predicted to lie 0.272_5 cm^{-1} above the energy given by the Dirac theory. In order to obtain an experimental value for this Lamb shift, the absolute wavelength of the L_α line of D has been determined by means of a 3 m vacuum grating spectrograph in fifth order. Lines of the series $6^1S_0-n^1P_1$ and $6^1S_0-n^3P_1$ of ^{198}Hg observed in the same order were used as standards. The wavelengths of these standards were obtained to ±0.0002A by the combination principle from lines in the visible and near ultra-violet regions, some of which were newly measured. Both the far ultra-violet Hg lines and L_α of D were simultaneously recorded on the plate in absorption. In this way, from six independent plates the wavelength of the L_α line of D was found to be 1215.3378 ± 0.0003A. This value refers to an unresolved doublet. If the relative intensity of the two doublet components (2:1) and the temperature of the absorbing column (80°K) is taken into account and the result compared with the Dirac value of L_α, a shift of the 1^2S level of $0.26_2 \pm 0.03_8$ cm^{-1} is obtained. The agreement with the predicted value is very satisfactory. (auth)

8055

EVAPORATION METHOD AND ITS APPLICATION FOR THE DETERMINATION OF BORON AND OTHER ADMIXTURES IN URANIUM. S. L. Mandel'shtam, N. N. Semenov, and Z. M. Turovtseva (Lebedev Inst. of Physics). Zhur. Anal. Khim. 11, 9-20(1956) Feb. (In Russian)

In new method of spectral analysis and its use in determination of boron and other admixtures in uranium are described. The sample is placed in a graphite crucible which is heated in a special heater up to temperature at which the fractional distillation of impurities takes place. The escaped vapors are condensed on the surface of a carbon or metal receiver and then burned in the arc or spark. The process of sample evaporation and spectra excitation are separated and impurities are accumulated. The method is used for the determination of the following impurities in uranium: B from 7×10^{-4}%; Cu, Fe, and Ni from 1×10^{-4}%; and V from 1×10^{-2}%. The accuracy of the analysis is now about 10 to 15%. (tr-auth)

8056

VACUUM EVAPORATION METHOD OF SPECTRAL ANALYSIS. A. N. Zaĭdel, N. I. Kaliteevskiĭ, L. V. Lipis, M. P. Chaĭka, and Yu. I. Belyaev (Zhdanov Leningrad State Univ.) Zhur. Anal. Khim. 11, 21-9(1956) Feb. (In Russian)

A new vacuum evaporation method is developed for the determination of small amounts of volatile impurities in non-volatile substances. This method is applied for determination of Cd, Sb, Bi, Cu, Sn, and Pb in Al_2O_3. The sample is held in a graphite crucible which is heated in a vacuum (10^{-2}mm Hg) by an a-c current to temperatures from 1400 to 2000°C. The volatile impurities evaporate and condense on a cooled copper or graphite electrode. After finishing the evaporation process the electrode is used for further spectral analysis. The vacuum evaporation and excitation processes are thus kept separated and can be controlled and regulated. The reproducibility of the vacuum evaporation method of spectrum analysis is ±10 to 20%. (tr-auth)

Refer also to abstract 7516.

THEORETICAL PHYSICS

8057 NP-5915

Rio de Janeiro. Centro Brasileiro de Pesquisas Físicas. NOTE ON THE NON RELATIVISTIC EQUATION FOR SPIN ½ AND 1 PARTICLES WITH ANOMALOUS MAGNETIC MOMENT. Notas de Física Vol. II, No. 5. J. J. Giambiagi. June 15, 1955. 10p.

The Thomas equation for non-relativistic particles with spin ½ and 1 is shown to be valid in quantum theory for particles with anomalous magnetic moments. (D.E.B.)

8058 NP-5917

Rio de Janeiro. Centro Brasileriro de Pesquisas Físicas. RELATIVISTIC THEORY OF SPINNING POINT PARTICLES. Notas de Física Vol. II, No. 6. J. Tiomno. July 10, 1955. 20p.

The relativistic theory of spinning particles is developed starting from the non-relativistic theory which is modified in order to become invariant under Lorentz transformations. In Part I the nonrelativistic theory of spinning particles is analyzed and reformulated in terms of two component spinors. A variational principle is established and written in a form which is appropriate to the passage to an invariant form.

In Part II the variation integral is made invariant in the usual way. Two alternate possibilities are obtained. In the first case the invariant Hamiltonian is quadratic in the momenta. In the second case the Hamiltonian is linear in the momenta. The theory obtained in this second case is essentially the same as the one developed by Proca. (auth)

8059 NP-6026

Brandeis Univ., Waltham, Mass.

ON THE STATISTICAL THEORY OF MANY-ELECTRON SYSTEMS. I. GENERAL CONSIDERATIONS PERTAINING TO THE THOMAS-FERMI THEORY. Technical Report No. 1. Sidney Golden. July 1, 1956. 41p. Project NR-041-362.

The density matrix for a many-electron system has been examined with a view toward extending the statistical theory of Thomas and Fermi. The single-particle density matrix is expanded in terms of a power series in $\hbar$, according to a procedure developed here for operators consisting of a series of powers of the classical Hamiltonian, the zeroth-order terms corresponding to the Thomas-Fermi theory. Second-order terms in the expansion are identifiable in the expression for the energy: they correspond to exchange energy, the Weizsäcker inhomogeneity correction for the kinetic energy and, possibly, correlation energy. Their presence follows from the expansion procedure, rather than from an a priori insertion into the theory. While the development here has been concerned mainly with the single-particle density function at the absolute zero of temperature, the procedure has been developed in sufficiently general terms to permit an evaluation to be made of the many-electron density matrix as a function of temperature. The results have been utilized to modify the theory of Fermi and Amaldi and then been applied to the following atomic states: H (^{2}S), He (^{1}S), He (^{3}S), C^{++} (^{1}S), O (^{1}S). The disparity between the calculated energy for He (^{3}S) and the observed value is less than 6%, while for the remaining cases the disparity does not exceed 2.5%. The radial densities obtained correspond roughly to available quantum densities; they fail, however, to indicate any "shell-structure" nor to display the expected behavior for distances very close to, or very far from the atomic nucleus. (auth)

8060

NUMERICAL CALCULATIONS FOR THE NEUTRON-PROTON SYSTEM WITH TENSOR FORCES. M. H. Kalos (Cornell Univ., Ithaca, N. Y.), L. C. Biedenhard (Rice Inst., Houston, Tex.), and J. M. Blatt (Univ. of Sydney, Australia). Nuclear Phys. 1, No. 4, 233-44(1956).

Low-energy properties of the neutron-proton system are tabulated for a variety of central and tensor potentials. (auth)

8061

ON CERENKOV RADIATION. N. L. Balazs (American Optical Co., Southbridge, Mass.). Am. J. Phys. 24, 185-8 (1956) Apr.

Cherenkov radiation is treated using a generalization of Dirac's representation of the four potentials. The case of moving media is also discussed. (auth)

8062

CLASSICAL MESON THEORY. I. S. Kahana and H. R. Coish (Univ. of Manitoba, Winnipeg, Canada). Can. J. Phys. 24, 225-39(1956) Apr.

Meson field theory is introduced from an elementary point of view in analogy with familiar classical fields. Three formulations are considered: scalar, pseudoscalar, and vector. In the symmetric theory the isotopic spin of a nucleon is taken to be a classical vector in charge space. (auth)

8063

THE THEORY OF ELEMENTARY PARTICLES. G. Heber. Ann. Physik 17, 102-8(1956) Feb. (In German)

8064

THEORY OF THE ELASTIC COLLISIONS OF PARTICLES IN MINKOWSKI SPACE-TIME. Jacques Romain. Bull. classe sci., Acad. roy. Belg. 41, No. 11, 1225-41(1955). (In French)

Certain aspects of the problem of the collision of particles are studied by using the geometry of the relativistic laws of conservation of impulse and energy. The results obtained are applied to some particular cases. (tr-auth)

8065

SCATTERING OF HIGH-ENERGY ELECTRONS AND ELECTRIC CHARGE DISTRIBUTION OF THE NUCLEUS. Jean Reignier. Bull. classe sci., Acad. roy. Belg. 42, No. 2, 173-84(1956). (In French)

Calculation of the phase displacement of each partial wave necessitates the knowledge of a function $\gamma_\nu(r)$, the solution of a Riccati equation. Calculations were made in a manner of approach using only one quadrature. The error, $|[\delta\gamma_\nu(r)]/[1+\gamma_\nu^2(r)]|$ is of the order of 1%. (tr-auth)

8066

NON-LINEAR GENERALIZATION OF SPINOR DIRAC EQUATION. D. Ivanenko and M. Mirianashvili (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 106, 413-14(1956) Jan. 21. (In Russian)

Spinor field studies are made as the continuation of previous investigations of the non-linearity of scalar, pseudoscalar, electromagnetic, and gravitational fields. The Dirac χ field interaction with another assigned Dirac field, ϕ, is of special interest because it leads to the analysis of non-linear Dirac equations describing electrons and nucleons and, according to the De Broglie theory of fusion, to other fields. (R.V.J.)

8067

CLASSIFICATION OF NON-LINEAR EQUATIONS AND RELATIVISTIC INVARIANT INTERACTIONS BY THE CONCEPT OF LORENTZ GROUP AND FUSION THEORY. G. A. Sokolik (Lomonosov Moscow State Univ.), Doklady Akad. Nauk S.S.S.R. 106, 429-32(1956) Jan. 21. (In Russian)

Classification of non-linear relativistically invariant equations defining the Bose field according to the Lorentz conception was given in a previous study. A method based on the above study permits the development of all spinor non-linear equations as well as the fusion theory. Examples of such calculations are developed. (B.V.J.)

8068

WAVE FUNCTION DISINTEGRATION BY IRREDUCIBLE REPRESENTATION OF THE LORENTZ GROUP. I. S. Shapiro (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 106, 647-9(1956) Feb. 1. (In Russian)

Investigation is made of the wave functions of a particle with zero spin. (R.V.J.)

8069

POTENTIAL ENERGY OF A MOLECULE IN A LIQUID. George H. Vineyard (Brookhaven National Lab., Upton, N. Y.). J. Chem. Phys. 24, 617(1956) Mar.

The theoretical basis of the potential energy function of a molecule in a liquid, as proposed by Girifalco (J. Chem. Phys. 23, 1728(1955)), is discussed. The physical validity of the proposed energy function is questioned. (C.W.H.)

8070

THE GAUGE TRANSFORMATION OF THE GREEN'S FUNCTION FOR CHARGED PARTICLES. L. D. Landau and I. M. Khalatnikov (Institute for Physical Problems, U.S.S.R.). Soviet Phys. JETP 2, 69-72(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 89-93(1955) July. (In Russian)

A gauge transformation is carried out on the Green's function and the vertex operator for charged particles interacting with an electromagnetic field. (auth)

8071

THE THEORY OF MOLECULAR ATTRACTIVE FORCES BETWEEN SOLIDS. E. M. Lifshitz (Inst. for Physical Problems, U.S.S.R.). Soviet Phys. JETP 2, 73-83(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 94-110 (1955) July. (In Russian)

A macroscopic theory is developed for the interaction of bodies whose surfaces are brought within a small distance of one another. The interaction is considered to come about through the medium of the fluctuating electromagnetic field. The limiting cases of separations small and large compared with the wavelengths of the absorption bands of the solid are studied. Upon going to the limiting case of rarefied media, the van der Waals forces of interaction between individual atoms are obtained. The effect of temperature on the interaction of the bodies is considered. (auth)

TRITIUM AND TRITIUM COMPOUNDS

8072

TRITIUM GAS TARGET FOR NEUTRON PRODUCTION. C. H. Johnson and H. E. Banta (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 27, 132-4(1956) Mar.

A self-contained T gas target including beam collimator, target cell, and gas reservoir which has been used for the production of neutrons from the $T(d,n)He^4$ and $T(p,n)He^3$ reactions is discussed. Beam collimators are 0.14-in. Ta apertures aligned in precision 1-in. tubing to assure accurate beam measurement. The gas cell is $^5/_{16}$ in. diam and may be any length less than 3 in. The target window is a 0.00005-in. Ni foil soldered on a $^1/_4$-in. i.d. re-entrant tube. Tritium is supplied from a UT_4 oven; H-T exchange is minimized by the use of nonhydrogenous materials. A discussion is given of handling of T. The target will tolerate a 1 μamp beam of 2-Mev deuterons for several days without foil damage. (auth)

URANIUM AND URANIUM COMPOUNDS

8073

OBSERVATION OF URANIUM WITH THE THERMOIONIC EMISSION MICROSCOPE. Micheline Sternberg. Compt. rend. 242, 1307-9(1956) Mar. 5. (In French)

A technique is described which avoids the problem of oxidation in microscopic examination of U. The technique consists in protecting the surface of the U with an impermeable layer of oxygen. Photographs obtained by this method are shown. (B.J.H.)

8074

A METHOD OF OBSERVING URANIUM WITH THE ELECTRONIC PHOTOEMISSION MICROSCOPE. E. Louis Huguenin and Maurice Gauzit. Compt. rend. 242, 1309-11 (1956) Mar. 5. (In French)

8075

REMELTING MAY PERMIT RECLAIMING URANIUM-CONTAMINATED METALS. P. B. Klevin and W. B. Harris (U. S. Atomic Energy Commission, New York). Nucleonics 14, No. 4, 936(1956) Apr.

A study was made of U-contaminated Ni, stainless steel, Cu, and Al scrap to determine the amount of U that might be picked up by scrap metal under various conditions of service, the effect of remelting this scrap, the residual U in the remelted metal, and if material treated in this manner can be sold into normal commercial channels without adversely affecting industry or the public health. Complete results are tabulated. Results indicate that such processing can be accomplished farily economically and without hazard to personnel. (B.J.H.)

8076

THE ANGULAR DISTRIBUTION OF FRAGMENTS FROM FISSION OF URANIUM AT HIGH EXCITATION ENERGIES. O. V. Lozhkin, N. A. Perfilov, and V. P. Shamov (Radium Inst., U.S.S.R.). Soviet Phys. JETP 2, 116-18(1956) Jan. (In English). Zhur. Eksptl.' i Teoret. Fiz. 29, 292-5(1955) Sept. (In Russian)

An investigation was made of the fission of uranium in P-9 fine-grained nuclear emulsions, soaked in aqueous solutions of uranium salts and irradiated with 660-Mev protons. The angular distribution of fission fragments relative to the direction of the proton beam was studied at excitation energies of the uranium nucleus ~75, 150 and 300 Mev. The angular distribution of the fragments can be described approximately by the function $a + bc \sin^4 \varphi$. The anisotropy increases somewhat with increasing excitation energy. (auth)

Refer also to abstract 8055.

PATENTS

CHEMISTRY

8077

METHOD FOR THE SEPARATION OF FLAVONOID COMPOUNDS. S. H. Wender and C. H. Ice. (to U. S. Atomic Energy Commission). U. S. Patent 2,738,346, Mar. 13, 1956.

An improved method of separating closely related flavonoid compounds is outlined. The method consists of passing a solution of the compounds, such as a mixture of xantho-rhamnin, rutin, and quercetin dissolved in a low molecular weight anhydrous aliphatic organic solvent, such as acetone, through a column of comminuted hydrous magnesium silicate adsorbent, then chromatographically eluting the resulting adsorbed compounds from the silicate material by means of an aqueous relatively low molecular weight organic solvent, such as an ethyl acetate solution saturated with water and containing a trace of acetic acid, and separately collecting the resulting individual flavonoid compounds. (auth)

8078

METAL PRODUCTION BY ELECTROLYSIS. R. A. Noland and C. Marzano (to U. S. Atomic Energy Commission). U. S. Patent 2,739,111, Mar. 20, 1956.

A method of purifying a carbon-containing actinide metal, such as U or Th by electrolysis is presented. The impure

actinide metal is made the anode in an electrolytic cell having a cathode of Ta or Mo and containing a fused electrolyte, at a temperature in the range of 385 to 425°C., consisting of 5 to 50% by weight of the actinide tetrafluoride and from 95 to 50% by weight of the LiCl–KCl eutectic mixture. The actinide metal so obtained is substantially spectroscopically pure as to C content, and may be readily freed of small amounts of Li and K by melting in crucible of the corresponding oxide. (auth)

8079

PREPARATION OF BORIC ACID ESTERS. R. F. Barnes, H. Diamond, and P. R. Fields (to U. S. Atomic Energy Commission). U. S. Patent No. 2,739,979, Mar. 27, 1956.

Boron trifluoride-diethyl etherate is mixed with a methanol solution of an alkali metal methoxide whereby trimethyl borate, alkali metal fluoride and diethyl ether are formed. Subsequent distillation at 35°C. removes the ether and further distillation at 55°C. results in an azeotrope of methyl alcohol and trimethyl borate from which the latter may be removed. (auth)

8080

PRODUCTION OF URANIUM SULPHATE. S. B. Smith (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,541, Apr. 10, 1956.

Uranium oxides wherein the U has a valence of less than 6 can be dissolved by reaction with dilute H_2SO_4 in the presence of a fluoride. After solution, an oxidizing agent may be added to convert the $U(SO_4)_2$ to UO_2SO_4. (auth)

8081

PROCESS FOR THE PRODUCTION OF DEUTERIUM OXIDE. H. C. Urey (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,543, Apr. 10, 1956.

The process consists of establishing a countercurrent flow of a mercaptan and a dilute aqueous solution of an alkali in a countercurrent system comprising at least 2 stages, mixing the mercaptan and the solution intimately in each of the two stages to cause an exchange of hydrogen isotopes to take place between the mercaptan and the solution, maintaining the two stages at different temperatures to produce different concentrations of D_2 in the aqueous solution in the two stages and to cause the concentration of D_2 in the solution to become relatively high at a point between the temperature states, and withdrawing, at a point between the temperature stages, solution that is enriched with respect to D_2. This D-enriched solution is then introduced as the raw material in a second countercurrent system and the enriched product from it into a third and so on until the maximum desired degree of enrichment is reached. (auth)

8082

PRODUCTION OF CURIUM 243. S. G. Thompson, B. B. Cunningham, and A. Ghiorso (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,627, Apr. 10, 1956.

Curium isotopes Cm^{243} may be produced by bombarding $Am_2^{241}O_3$ with a 40 Mev beam of α particles in a cyclotron resulting in the formation of Cm^{243} as well as other elements constituting removable impurities. The bombarded target material is dissolved in HNO_3 and then treated with NH_3 to precipitate Am and Cm hydroxides. This precipitate is dissolved in K_2CO_3 and treated with NaOCl to remove the Am. The filtrate is treated with strong KOH to form a hydroxide precipitate of Cm and the remaining Am, which is retreated as above to reduce the Am content. Final purification from Am is made by adsorbing the Cm and remaining Am on a cation exchange resin and selectively eluting with ammonium citrate. (auth)

8083

SEPARATION OF HAFNIUM AND ZIRCONIUM SALTS. W. K. Plucknett (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,628, April 10, 1956.

Zirconium salts can be separated from Hf salts by contacting a mixed solution of these salts with a solution of salicylic acid dissolved in a substantially water-immiscible, oxygen-containing, inert organic solvent, which has the additional property of not dissolving the Zr or Hf salts. Benzy alcohol, n-amyl alcohol, isoamyl alcohol, and nitrobenzene are noted as being suitable for this solvent use. Zirconium is preferentially complexed by the salicylic acid and taken up on the organic phase, thus effecting its separation from Hf. (auth)

8084

SEWER SAMPLER. P. V. Henton (to U. S. Atomic Energy Commission). U. S. Patent No. 2,742,788, Apr. 24, 1956.

A sewer sampler was constructed capable of taking liquid samples and rejecting solid material. Two vertical rectangular screens are joined on one edge to form a "V," and a baffle containing louvers is positioned outside of the "V." The open end of the "V" has a narrow channel leading to a weir shielding a cylinder, and an eductor leading into the sampler system piping. The sample is placed in an enlarged rectangular chamber of the sewer pipe. (auth)

8085

METHOD OF RECOVERY OF URANIUM BY A RESIN-IN-PULP PROCESS. D. Kaufman and G. W. Lower (to U. S. Atomic Energy Commission). U. S. Patent No. 2.743,154, Apr. 24, 1956.

Uranium can be recovered from acid leach liquors by contacting the liquor with ion exchange material capable of fixing U compounds in the form of complex ions in one zone and causing flow through a screen having a predominantly vertical component and openings at least two mesh sizes finer than the particle size of ion exchange material and at least 2 mesh sizes larger than the ore pulp particles, and causing a turbulent layer of gas and liquid bubbles to pass across the screen sufficient to prevent blinding of the screen whereby uninterrupted screening and circulation within the zone is effected. A group of such zones or cells are arranged in series, and as the ore pulp passes from cell to cell its content is completely extracted. (auth)

8086

METHOD OF PREPARING THE DOUBLE HALIDE SALTS OF THORIUM AND ALKALI METALS. S. Z. Cardon (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,155, Apr. 24, 1956.

The method consists in reacting $Th(CO_3)_2$ or ThX_4 with an alkali metal halide at 250 to 300°F, in the presence of the corresponding ammonium halide, and then heating to drive off the ammoniacal products. (auth)

8087

URANIUM RECOVERY PROCESS. M. C.Metziger, A. Long, and E. M. Stoltz, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,156, Apr. 24, 1956.

A process is presented for the recovery of U from phosphate rock. After digesting the rock with H_2SO_4 the solution is treated with a suitable oxidizing agent and the pH is adjusted with alkali to about 4.0. This effects the precipitation of the Ca, Fe, and Al phosphates. The U content is then precipitated by addition of a suitable reducing agent ($NaHSO_3$) and a filter aid (diatomaceous earth). Finally, the U values are separated from the filter aid by redissolving the U (with H_2SO_4 and an oxidizing agent), filtering out the filter aid, and reprecipitating the U with alkali. (auth)

8088

RE-EXTRACTION OF URANIUM FROM ORGANIC SOLVENTS. F. T. Hagemann, L. I. Katzin, and N. N. Hellman (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,157, Apr. 24, 1956.

The recovery of UO_2^{2+} values from organic solvent solutions by the use of an aqueous solution of a "complexing" agent is described. The complexing agent may be sulfate, phosphate, oxalate, or fluoride ions. The value of the process lies in the reduction of aqueous recovery solution volume through the addition of the "complexing agent." (auth)

8089

PROCESS FOR PRODUCING URANIUM PENTACHLORIDE. A. D. Webb and H. P. Kyle (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,158, Apr. 24, 1956.

Uranium pentafluoride can be prepared by passing a stream of UCl_4 particles through a stream of Cl_2 in a tubular reaction vessel. A portion of the reaction tube is heated to 550°C and here the UCl_5 is formed and volatilizes immediately. The Cl_2 stream sweeps the UCl_5 on into a cooler portion of the tube and the UCl_5 vapor condenses and is separated from and purified of free Cl_2. (auth)

8090

RECOVERY OF URANIUM FROM AQUEOUS SOLUTIONS. G. A. Lutz (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,159, Apr. 24, 1956.

A process is outlined for separating UO_2^{2+} values from aqueous H_2SO_4 solutions containing impurities usually associated with U and selected from the group consisting of Fe, Al, P, Mg, V, Tl, Cu, Mn, Cr, Ca, K, La, Si, and Sr. The method consists of contacting the solution with an anion exchange resin whereby UO_2^{2+} values are preferentially and some of the contaminants partially adsorbed, treating the resin with an aqueous mineral acid anion-containing solution for the elution of adsorbed values whereby the adsorbed contaminants and the U contaminants are fractionally and selectively eluted and with a H_2O_2-containing solution of NaOH whereby adsorbed Si is removed from the resin, and collecting the eluted solutions in fractions. (auth)

8091

PREPARATION OF ANHYDROUS VANADIUM TRIFLUORIDE. D. E. Carpenter, C. P. Johnston, H. P. House, and K. O. Johnsson (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,161, Apr. 24, 1956.

Anhydrous VF_3 can be prepared from V_2O_3 by contacting the V_2O_3 at a temperature below approximately 100°C with anhydrous HF until the V_2O_3 is substantially completely converted to a $VF_3 \cdot xH_2O$ and contacting the resulting hydrate at relatively elevated temperatures with anhydrous HF. (auth)

8092

SUBLIMATION APPARATUS. R. Krohn and R. J. Schmidt (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,168, Apr. 24, 1956.

A sublimation apparatus designed to purify halogen derivatives of U compounds is described. It is desired to vaporize and recondense the material without transition through the normal liquid stage. This may be accomplished by heating the material in a high vacuum obtained by suitable vacuum pumps used in the various stages depending upon the vacuum desired and the amount of gases to be pumped. The material is placed in a receiving container fitted in combination with a condensing chamber, cooling coils and piping. The pressure is first lowered to the order of 10^{-2} mm of mercury, then a heating coil is placed about the protruding charge boat. Subsequently, the temperature is raised to about 800°C and the pressure lowered by a diffusion pump to 5×10^{-5} mm and the material forms as crystals in the condensing chamber. A seal similar to a piston ring maintains the vacuum in the charge boat. At completion of the operation, lasting from 8 to 12 hr the heating shell is removed, an inert gas is bled into the condensing chamber, and the purified crystals are scraped from the walls thereof. (auth)

8093

HORIZONTAL SUBLIMATION APPARATUS. J. C. Hecker (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,169, Apr. 24, 1956.

A horizontal apparatus designed for the purification of halogen derivatives of U compounds is described. It consists of a horizontal charge boat fitting into a heating shell or crucible, a cooling chamber for condensation of the formed vapors, a scraper to gather the crystals in one end, and a collection pot thereunder for the accumulation of the crystals. The apparatus is designed to operate under reduced pressure and a means to accomplish this is included. The compounds are placed in the charge boat, inserted in the heating chamber, and vaporized, with the vapors being collected in the condensing chamber where they are raked or scraped into the collecting pot and recovered. (auth)

8094

ELECTROLYTIC PROCESS FOR RECOVERING URANIUM COMPOUNDS FROM CARBONATE LEACH LIQUORS. G. W. Clevenger (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,222, Apr. 24, 1956.

An electrolytic process has been developed which obviates the expensive addition of NaOH to Na_2CO_3–U bearing leach liquors. The NaOH addition, and consequent pH change, serve to break up the soluble UO_3–Na_2CO_3 complex formed in the leaching operation, and cause precipitation of the less soluble Na_2UO_4 to effect recovery of the U values. In this process, the Na_2CO_3 leach solution is subjected to electrolysis and NaOH is formed in the cathode compartment, causing precipitation of a portion of the U at this point. The original leach liquor composition is then restored by mixing the high pH catholyte with the $NaHCO_3$ containing anolyte, and adding sufficient Na_2CO_3 to compensate for the amount of Na lost in the Na_2UO_4 precipitation. (auth)

8095

ORGANIC COMPOUND BOND RUPTURING PROCESS. L. T. McClinton, W. M. Garrison, and M. Burton (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,223, Apr. 24, 1956.

Cyclohexane, when subjected to neutron radiation, decomposes into H_2 and a polymeric material. (auth)

8096

ELECTROLYTIC CELLS. R. Q. Boyer (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,228, Apr. 24, 1956.

Electrolytic cells were adapted for use in conjunction with the reduction and purification of wash solutions derived from calutrons employed in the calutron method of producing U enriched with U^{235}. The cell has a casing comprised of an upper portion removably secured to a lower portion with a plurality of alternately disposed anode and cathode compartments separately enclosed within the upper portion. These compartments have porous walls and partitioning members and are adapted to contain a first body of electrolyte and a second body of circulating electrolyte mixed with a solution to be treated. The cathode compartments each have movable cathodes which dip successively into a Hg pool disposed in the lower portion of the cell casing and into the aforesaid body of circulating electrolyte. In operation, the compartments are initially filled with an electrolyte comprising 3N HCl; then the solution to be treated is conducted through the cathode compartment, with the cathode operating as described, whereby the solution is reduced in the cell. (auth)

8097

LOW WEIGHT CONTAINER FOR RADIOACTIVE MATERIALS. H. J. Browne and N. B. Garden (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,372, Apr. 24, 1956.

A light-weight portable container for radioactive materials of minimum weight and dimensions having a relatively constant and safe level of radiation on all surfaces is described. This container made of U or W consists of a relatively thick inner container, supported centrally by webs and fittings, shaped so that its thickness is inversely proportional as the radius from the center to the cubical surface of the outer container. For example, since one corner of the outer cubical container is farther from the radiation source the thickness of the inner container at the corresponding point would be less in order to achieve a constant radiation level on the outer surface. The container by reason of this design may safely carry radioactive materials under such limitations as would be imposed by the use of air freight. (auth)

8098

SEPARATION OF FLAVONOID COMPOUNDS. S. H. Wender, T. B. Gage, C. H. Ice, and Q. L. Morris (to U. S. Atomic Energy Commission). U. S. Patent No. 2,744,893, May 8, 1956.

Flavonoid aglycones can be separated from glycosides by the following method: The aglycone–glycoside mixture is first adsorbed on a finely divided cation exchange resin, and then the glycosides may be selectively eluted by a solvent mixture consisting of 50% or more of water combined with a low molecular weight aliphatic organic solvent; after the removal of the glycosides, the aglycones remaining on the resin can be eluted by use of an organic solvent containing less than 10% water; an isopropyl alcohol–water mixture is specifically mentioned as the glycoside elutant. (auth)

8099

CHARGE BOAT FOR VOLATILIZATION. R. Krohn (to U. S. Atomic Energy Commission). U. S. Patent No. 2,747,972, May 29, 1956.

A charge boat was designed to be readily inserted and removed in a horizontal sublimation apparatus and arranged to provide extensive supporting surface for the material to be treated in order to obtain rapid and complete volatilization. The specific apparatus has proved very useful in the large scale conversion of UCl_5 to UCl_6 at elevated temperature and reduced pressure. (auth)

ENGINEERING

8100

SOLVENT EXTRACTION EQUIPMENT. L. L. Burger (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,170, Apr. 24, 1956.

Modifications in a perforated-plate pulsed column are outlined. A vertical column is provided with perforated plates, inlet, outlet and bleeder lines at both top and bottom of the column, together with lines, storage tanks, pressure tanks and pumps for both liquids. The basic improvement of the system is the valve timing arrangement whereby the pulse is formed that facilitates the mixing. The bottom inlet, top outlet and bleeder for the lighter liquid, open and close at approximately the same time, likewise the top inlet and bottom outlet and bleeder for the heavier liquid. The rapid surging flow of each liquid, providing the needed pulse, results from timing each outlet and bleeder valve to close simultaneously with or slightly before each inlet valve. (auth)

8101

FILTER WITH FRACTIONAL CRYSTALLIZATION MEANS. W. H. Bruggeman and B. G. Voorhees (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,552, May 15, 1956.

A cold-trap-type filter has been used to remove Na_2O crystals from a molten Na heat exchanger system. Oxygen entering such a system through leaks will combine with Na to form Na_2O which will deposit in cooler portions of the system and choke the flow. This filter installed in a by-pass will remove the Na_2O and other solid impurities that may be present in the molten sodium. The by-passed stream is cooled to 400° then to 350°F in the filter, at which temperature the crystals are formed and then forced through steel wool which collects and holds the crystals and other impurities. The Na is then reheated to system temperature utilizing the heat extracted in the cooling steps. The holdup time required for Na passage is 5 min and the capacity is 7500 lbs/hr. The cooling surfaces must be periodically cleaned of deposits and the steel wool renewed as needed. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

8102

APPARATUS FOR THE PRODUCTION OF COATINGS OF PURIFIED METALS. Z. M. Shapiro and J. McDonald (to U. S. Atomic Energy Commission). U. S. Patent No. 2,739,566, Mar. 27, 1956.

An improved method and apparatus was developed for readily producing purified metals, such as Zr, Ti, and the like, in massive form, preferably as elongated rods, by thermal decomposition of a volatile halide of the metal on a heated filament. Among other features, the improved apparatus provides for increasing the rate of deposition of the purified metal, increasing the cross sectional area of flow of the metal halide vapor between the relatively cool vapor source and the relatively hot filament, controlling the relative temperatures of the crude metal sponge and the filament spaced therefrom, and producing larger bars of deposited metal as a result of more efficient heat dissipation. (auth)

8103

ELECTROLYTIC CUTTING OF METALS. G. L. Kehl and I. Moch, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,739,935, Mar. 27, 1956.

A method and apparatus are described for the electrolytic cutting of those metals and alloys which are subject to electrolytic attack. The apparatus consists of a tank, containing the metal to be cut mounted so that it may be rotated, the electrolyte, the cutting arm made up of a central cutting electrode, and two exterior robber electrodes separated by insulators, a means to adjust this cutting arm in relation to the metal, circuitry to impress a potential between the cutting electrode and the robber electrodes, and a nozzle directing a flow of electrolyte against the cutting arm. This method and apparatus will produce a clean straight edged cut, free of mechanically imposed stresses, burrs or jagged edges, and no metal is lost by dust, shavings or metal being burned away. (auth)

8104

METHOD OF PREPARING METAL AND APPARATUS THEREFOR. G. Derge and G. P. Monet (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,173, Apr. 24, 1956.

Metals (of atomic wt. 90 or higher) of extremely high purity were prepared by the thermal decomposition of a volatile compound (the iodide) of the metal. The method consists in passing I_2 vapor over the impure metal at an elevated temperature and the subsequently heating the metal iodide vapor so formed to an even higher temperature in order to effect decomposition and deposition of massive (not powdered) metal of the walls of a tubular, calcium beryllate-lined, reaction chamber. (auth)

8105

URANIUM–TITANIUM ALLOYS. J. R. Keeler and H. A. Saller (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,174, Apr. 24, 1956.

Binary Ti–U alloys with superior corrosion resistant properties are described. The fabrication of reactor fuel elements using these alloys is suggested. (auth)

8106

TERNARY ZIRCONIUM BASE ALLOY CONTAINING Sn AND Ti. W. Chubb, Jr. and L. L. Marsh, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,746,861, May 22, 1956.

Ternary Zr-base alloys containing <4 wt. % Sn and <6 wt. % Ti were prepared. (auth)

PHYSICS

8107

CONDENSABLE VAPOR EXTRACTION APPARATUS. E. O. Lawrence (to U. S. Atomic Energy Commission). U. S. Patent 2,737,799, Mar. 13, 1956.

A device has been developed for obtaining a very high vacuum in a large tank. The pumping out operation is considerably expedited when the vacuum pump is augmented by a condensable vapor extraction trap. This trap, containing a coolant such as liquid air or liquid nitrogen, located in the tank condenses out much of the contained vapor, thereby substantially halving the time required for pumping out. Heretofore, these traps containing the condensed vapors have remained in the tank necessitating the constant addition of coolant to keep the vapors condensed. This device permits the removal of such a trap after the desired vacuum has been obtained and seals the opening after removal thus eliminating the need of constantly adding the expensive coolant during the period the vacuum is maintained, which may be many days. (auth)

8108

LIQUID MONITORING DEVICE. W. M. Hurst (to U. S. Atomic Energy Commission). U. S. Patent 2,738,426, Mar. 13, 1956.

A liquid monitoring device was designed to indicate the radioactivity level in water, especially β. Water tangentially enters a cylindrical container and a vortex is produced by mechanically rotating the cylinder producing a wall of water as thick as probable beta ray penetration. A thin window proportional counter extends down into the vortex. This arrangement leaves the counter relatively free of contamination by splashing, but forms a water blanket about the counter thick enough to measure the expected low beta radiation activity level. Water is continuously flowing through the monitor and out through a bottom egress giving a continued indication of the activity level. This device is especially useful to monitor potable water supplies in the vicinity of nuclear reactors or radioactive waste storage sites. (auth)

8109

AMPLIFIER CIRCUIT. J. J. Stone, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,739,237, Mar. 20, 1956.

A gated amplifier was adapted to receive input pulses of greatly different magnitudes, to reject those signals during gating intervals without producing spurious output pulses, and to recover rapidly to an operative state for receiving successive pulses. It delivers output pulses of a substantially predetermined magnitude corresponding to certain input pulses and rejecting certain other input pulses. It also converts positive and/or negative-going input signals of widely different amplitudes into signals of predetermined magnitude. (auth)

8110

CURRENT MEASURING DEVICE. A. A. Windsor (to U. S. Atomic Energy Commission). U. S. Patent No. 2,739,285, Mar. 20, 1956.

A current marker type of current measuring device utilizing a single peaking transformer is described. Heretofore, a plurality of peaking transformers have been required to obtain incremental current measurements over a wide range of current change. With such a system of peaking transformers used for marking selected values of current, each transformer functions twice during every cycle of a periodic current. This device employs a single peaking transformer which is supplied bias current in discrete increments in response to the current change during each cycle; it also provides the advantage of flexibility of independently calibrated adjustments for each measurement. (auth)

8111

ALPHA SURVEY METER CIRCUIT. R. W. Schede (to U. S. Atomic Energy Commission). U. S. Patent No. 2,739,286, Mar. 20, 1956.

A sensitive, fast, stable electronic amplifier having novel compensating features for minimizing drift was developed. It is a portable, battery-operated, inverse feedback d-c amplifier for use with conventional ionization chambers. It provides a novel circuit for compensating for decay of filament and/or screen grid voltage sources and is adapted to minimize the effects of leakage currents. It will also degenerate the effect of the chamber capacity, and any leakage currents of chamber or tube of an ionization chamber. (auth)

8112

NEUTRONIC REACTOR MEASURING AND SAFETY ROD OPERATING APPARATUS. L. B. Borst and H. W. Newson. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,592, Apr. 10, 1956.

A simple, reliable safety device applicable to an air-cooled neutron reactor is described. A gas capable of sustaining a measurable radioactive half life, e.g., air, a suitable component of which is argon, is blown through tubes transversing a reactor, resulting in the formation of A^{41}. The radioactive level of the A^{41} is proportional to the neutron density within the reactor and may be accurately measured by normal means, for in instance, an ionization chamber. When the detecting indicator signals a rise of radioactive argon over a predetermined level a safety rod drive system is actuated shutting down the reactor. (auth)

8113

FLUID COOLED NEUTRONIC REACTOR. H. E. Metcalf, H. W. Johnson, and R. S. Chisholm (to U. S. Atomic Energy Commission). U. S. Patent No. 2,741,593, Apr. 10, 1956.

A method is outlined for building a water-cooled nuclear reactor whereby the amount of cooling water within the reactor core may be increased resulting in operation at a higher power level. Heretofore, the amount of coolant has been limited by reason of neutron economy. Addition of a suitable amount of fissionable material to the coolant results in the production of neutrons to offset the neutron loss caused by capture in the coolant. For instance, the addition to the water of 0.2 to 1.2 atoms of U^{235} per 1000 molecules of water will permit enlarging the coolant passages, resulting in greater coolant flow and heat removal roughly ten times the amount permitted without such enrichment. This permits operation at a higher power level than has been possible heretofore. (auth)

8114

PORTABLE SCINTILLATION SURVEY METER. R. A. Dandl (to U. S. Atomic Energy Commission). U. S. Patent No. 2,742,576, Apr. 17, 1956.

A portable sensitive scintillation survey meter for detection of radioactivity and radioactive particles was developed. It has an improved phosphor detector element which accounts for the increased sensitivity and means are also provided for controlling the size of the photomultiplier output pulses in an inexpensive, convenient manner which does not require the control element to be in the high voltage lead. The gain of the photomultiplier tube may be adjusted from zero to substantially the normal maximum output of the tube and the size and shape of the pulses may be kept substantially constant despite aging batteries, change in tube characteristics, or changes in load current of the photomultiplier. (auth)

8115

DEMOUNTABLE FILAMENT ASSEMBLY. W. J. Armstrong, P. I. Corbell and K. H. McPhee. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,742,587, Apr. 17, 1956.

A demountable assembly is described for the extremely high current capacity of tubes of the resnatron type where the average power may be as high as 50 kw. This high power is in part made possible by maintaining the high current filament cool enough to prevent injury to the filament and to prevent the active elements of the assembly from bowing or being deflected. The filament assembly comprises 36 active W filaments which are 6 in. in length, $\frac{1}{4}$ in. wide, and 0.040-inch thick, and are mounted about the circumference of an assembly. Each filament draws 350 amp and the total heating current is 12,000 amp at 5 v, 60 cycle a-c. The total power for heating is near 60,000 watts. A series of springs are provided for maintaining the filaments under constant tension of approximately 10 lb so that they are not deflected when heated due to thermal expansion and grain growth, and also not displaced relative to the center line of the filament assembly. The entire assembly is mounted between a lower supporting cylinder and an upper supporting member which are cooled by water pipes. (auth)

8116

SUBMERGED REACTOR. L. A. Ohlinger (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,224, Apr. 24, 1956.

A thermal reactor, submerged in a large body of water such as a river or a lake for both cooling purposes and radiation shielding is described. A container, fitted with tubes open to the surrounding water but retaining with radial clearance sealed fuel elements, is lowered into the body of water by a rail and pulley arrangement. Between the tubes but sealed from the body of water is the selected moderator for de-energizing the fission neutrons to the thermal range. A means is provided for forcing cooling water through the tubes, but in the event of a pump failure a sufficient head of water is provided that natural circulation affords cooling. It is estimated that a submerged depth of 18 ft or greater will provide adequate shielding for personnel. (auth)

8117

REACTOR. E. P. Wigner, A. M. Weinberg, G. J. Young, and L. A. Ohlinger (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,225, Apr. 24, 1956.

A solid-fuel heavy-water-moderated reactor is described. The fuel is in the form of rods or slugs and the moderator is pressurized to prevent boiling in order to maintain a relatively high density and minimize the critical size of the reactor. Provision is made for the rapid evacuation of the D_2O moderator, thereby stopping the chain reaction in the event of an emergency. A thin walled Al vessel housing the core containing the fuel elements is surrounded by a neutron reflector of graphite and He under pressure within a heavy outer shell to equalize the force on the inner walls of the vessel. This design results in a compact relatively safe reactor making economical use of the expensive materials contained therein. (auth)

8118

APPARATUS FOR THE BOMBARDMENT OF SAMPLES WITH FAST NEUTRONS. H. W. Newson (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,226, Apr. 24, 1956.

A sample holder capable of permitting of the bombarding of a contained sample with fast neutrons only was developed. The apparatus consists of an outer layer of U enriched with U^{235} and an inner liner of B. In operation, the sample is placed in the container which is then placed in a reactor. The neutron flux in the reactor causes atomic fission of the enriched U isotope which produces both fast and slow neutrons. The B liner captures or absorbs most of the slow neutrons before reaching the contained sample, leaving the highly energized fast neutrons free to penetrate the sample which is a desired object in certain work. (auth)

8119

MAGNETIC ARC-WELDER. E. S. Bettis and E. R. Mann (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,342, Apr. 24, 1956.

An arc welding device has been designed to produce a uniform weld between a tube and a tube sheet without imposing a severe thermal stress on the welding area. The important feature includes aligning the electrode axially with the tube, where normally the electrode travels a circumferential path about the tube, and placing an electromagnet about the axial electrode so that the magnetic flux crosses the arc at an angle. This configuration produces motion according to the motor-generator theory, the motion being transmitted to the arc and results in the arc rapidly revolving about the tube circumference. The speed of this rotation produces a uniform weld and heats the tube and tube sheet circumference evenly, producing no radial thermal stress. This welder should be of great benefit in welding small size tubes to the tube sheet. (auth)

8120

ELECTRONIC ANALYZER. Q. A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,371, Apr. 24, 1956.

Modifications were made in monitoring apparatus of the type providing a graphic representation of the physical properties of an ion beam, in a mass spectrometer and for determining the position of the beam with respect to the receiver. By the use of this device, the exact location of the ion beam with respect to the receiver is immediately apparent and the effect of any adjustments may be viewed during the time that they are being made so that the possibility of incorrect adjustments is minimized. This is accomplished by impressing a sweep voltage upon the ion accelerating voltage, thereby varying the ion trajectory. This results in the beam of ions of the desired mass being swept away from the receiver during the short periods of analyzer operation. Thus, in order to obtain an indication at the receiver during operation of the analyzer, the value of the sweep voltage which is impressed upon the ion accelerating voltage is so chosen that ions of another known mass are instantaneously focused at the receiver during the sweep. Consequently, the amount of the sweep voltage which when impressed upon the original ion accelerating voltage will focus the other beam of ions at the receiver is determined. (auth)

8121

MAGNETIC FIELD MEASURING DEVICE. J. M. Kelly, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,743,416, Apr. 24, 1956.

Details are presented of an apparatus for measuring the intensity of an unknown magnetic field. It can measure either static or dynamic magnetic fields at any desired point of measurement. The apparatus includes a magnetic core which is disposed along the lines of force of the unknown magnetic field at the point of measurement, the core having a very high permeability at zero magnetic field and a low permeability at all other values; a search coil wound about the core in the unknown magnetic field; means for establishing a standard magnetic field about the core, the lines of force of which are of opposite polarity to the lines of force of the unknown field; means for varying the standard field whereby a voltage pulse is induced in the search coil when the resultant magnetic field about the core equals zero and means for measuring the standard magnetic field. (auth)

8122

RE-ENTRANT COOLING REACTOR. T. V. Moore (to U. S. Atomic Energy Commission). U. S. Patent No. 2,744,064, May 1, 1956.

Improvements were made in the fabrication of cooling systems of a reactor of the H_2O-cooled slurry or solution type. It was found difficult to seal the many openings in the sides of the reactors where the thin walled Al tubes enter and exit carrying the cooling water. This method provides cooling by introducing cooling water from a single pipe, by many U-tube branches therefrom, extending through a hollow cover into the slurry or solution in the reactor tank, and discharging into the hollow cover which serves as a manifold, and from there through numerous small ducts into a collector header encompassing the cover. The water filled cover which may be made of several sections fitted together, also provides some shielding. (auth)

8123

BINARY COUNTER. J. C. Chu and D. H. Jacobsohn (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,006, May 8, 1956.

A decoding-type counter was adapted for very fast operation in electronic computers. It is comprised of a binary counter, including a set of binary responsive storage toggles, and at least one set of binary responsive counting toggles, the state of which toggles may be changed in response to the examination of the storage toggles by the gates and incidence of a counting pulse. The chain of transfer gates above mentioned operate as a decoding function table of all of the previous stages to determine instantaneously the correct setting of each respective stage, without waiting for a series of pulses or transformations to pass through the entire counter unit. (auth)

8124

ION PRODUCING MECHANISM. F. F. Oppenheimer (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,017, May 8, 1956.

The density of an ion beam can be increased by increasing the percentage of charged material ionized and projected through the calutron. An important feature of the ion producing mechanism resides in the combination of an ionizing chamber having an exit opening, a pair of accelerating electrodes disposed without the ionization chamber and closely adjacent to the exit therefrom, and a crescent shaped filament being so disposed as to project a concentrated stream of electrons across the ionizing chamber behind the exit. Another feature of the invention resides in causing the ionizing electron stream to travel close to the boundary of the arc plasma present in the ionizing chamber. (auth)

8125

BEAM CURRENT REGULATOR. W. R. Baker and R. DeLiban (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,018, May 8, 1956.

An apparatus for automatically regulating the ion beam in a calutron is described. This is accomplished by automatically adjusting the accelerating voltage to compensate for changes in the accelerating voltage itself, for changes in the magnetic field, and for orienting the beam with respect to a particular collecting element. This is done without materially affecting the potentials of the ion collecting electrodes although means are provided responsive to the current flowing to one of the collector elements for providing a voltage proportional thereto and for impressing this voltage upon the accelerating electrodes for adjustments. (auth)

8126

PRESSURE TESTING DEVICE AND METHOD. P. E. Collins and G. M. Inman (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,279, May 15, 1956.

A pressure technique is outlined for testing canned U slugs for defects in the can or weld closures. A leak in a canned slug will permit O_2 to contact the U, resulting in swelling of the can and probably casualty shutdown of the reactor accompanied by great danger and expense. One end of the slug is inserted in a glass container partially filled with kerosene or glycol, the container is then rotated until the fluid covers the slug, and the pressure in the container is reduced well below atmospheric pressure. If the canning is defective air will have entered until atmospheric pressure is reached, and this air or gas will escape the slug under reduced pressure in the test device and may be seen rising as bubbles, thus revealing the defective can. (auth)

8127

ARC REGULATOR FOR CALUTRON ION SOURCE. R. DeLiban (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,964, May 15, 1956.

Arc regulators for calutron ion sources were modified to include means for protecting the filamentary cathode of the ion generator from electrical abuse, whereby longer cathode life is obtained. Further, the power lines feeding the arc supply and the filamentary cathode supply are near ground potential since the present device allows the operation of the arc regulator unit and its associated controls at ground potential regardless of the high potentials applied to the ion generator unit. (auth)

8128

CALUTRON RECEIVERS. E. J. Lofgren (to U. S. Atomic Energy Commission). U. S. Patent No. 2,745,965, May 15, 1956.

A calutron receiver was adapted to collect and retain a maximum percentage of the ions traveling in a selected portion of an ion beam. It has a single ion receiving pocket for collecting one isotopic component of an ion beam and has an electrode for intercepting another adjacent isotopic component for beam control purposes. Means are provided for prohibiting the scattering of material from one pocket to another in the path of a closely adjacent beam component. Further means are provided for selectively closing the ion receiving pocket to the admission of ions when beam conditions are unsatisfactory for the collection of material. (auth)

8129

VALVE MEANS FOR CHARGING CONTAINERS WITH FLUID. L. A. Ohlinger (to U. S. Atomic Energy Commission). U. S. Patent No. 2,746,473, May 22, 1956.

A fusible valve was used for charging containers with a fluid, and especially for charging tubes containing U slugs

with He to indicate possible leaks in the tube. The valve contains a ball check, a low melting point member, and a fluid passage. The fluid, entering an axial passage under pressure unseats and flows around the ball check, through a central passage of the fusible material and into the container. The ball check seals upon removal of the source pressure and heat is externally applied, as by an induction coil, to the valve body, melting the solder and closing the central passage. Upon removal of the heating source the solder solidifies and seals the gas in the container which then may be inserted in the reactor. (auth)

8130

POWER OR VOLTAGE MEASURING MEANS. D. J. Nigg (to U. S. Atomic Energy Commission). U. S. Patent No. 2,747,126, May 22, 1956.

A measuring device is described which is simple, rugged and relatively inexpensive to build and useful for directly, visibly and accurately indicating the attainment of peak voltage values. The device comprises in part an inner conductor having a hemispherical termination, electrically insulated from an outer conductor, with a portion of the inner conductor near and including the termination surrounded by a chamber containing an ionizable gas, such as Ne or A at a reduced pressure. If desired, a deionizing agent such as a halogen or water vapor may be included in the chamber. Also, the breakdown voltage may be stabilized by applying a minute spot of Co^{60} adjacent the terminal position. The visible light which occurs on breakdown may be viewed through a transparent portion of the outer conductor. The breakdown voltage is determined by the pressure of the contained gas. (auth)

8131

PRESSURE CHAMBER CLOSURE APPARATUS. R. B. Meuser (to U. S. Atomic Energy Commission). U. S. Patent No. 2,747,762, May 29, 1956.

An air-lock closure was designed for large pressure chambers such as cyclotrons, where implements may be entered or withdrawn with a relatively small loss of the chamber vacuum so as not to overburden the pumping system or cause considerable loss of time to reestablish the desired vacuum. The apparatus consists of an outer and inner door remotely controlled having an aperture of 15 × 20 in., with tracks for the movement of the desired implements. The door is hinged on one side so that when opened it presents no obstruction over the aperture. (auth)